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THE PHYSICIAN AND HUMAN CONSERVATION *

JAMES H. McBRIDE, M.D.
PASADENA, CALIF.

On this occasion, when you might expect me to speak in the line of the specialty, the subject of human conservation may seem rather remote. It has none of the interest of novelty and has no problems for the laboratory except that oldest of laboratories in which the problems of life are being solved. The subject is familiar, but life is made of familiar things of which we find it necessary frequently to remind ourselves, and experience teaches that it is much more profitable to be reminded than to be instructed.

The existence of so much disease that is preventable, the increasing amount of insanity, feeble-mindedness and imbecility that are usually evidence of individual and family degeneracy, the poor showing of young men in our recent war conscription, and other conditions of bad import too numerous to be recounted have led me to consider at this time the subject of disease prevention and human conservation. This can only be a suggestion, as there is no time to frame an argument; it can only be a hint of the facts, not a presentation of them.

My subject is not so remote from our specialty as it may seem, for we are interested in disease and its prevention, and conservation deals with both. The great merit of prevention is that it begins at the source and that is the place to stop trouble. To bring a dying man back to life and health is more attractive and picturesque than the homely process of preventing him from being sick. Just a plain healthy man may be useful, but he is not necessarily interesting — society, however, prefers that a man should first be healthy. We have wasted a vast amount of human material in the past through mere neglect; we have wasted as much more through being satisfied to care for the wreckage, without considering how to stop the supply. The result has been that while we have been building hospitals and asylums, disease has been increasing with the growth of population, so that the age-old "pestilence that walketh in darkness," in the form of devitalizing con-

* Presidential address before the American Neurological Association at Atlantic City, N. J., June 17-18, 1919.

ditions, has been breeding disease and degeneracy and pouring its victims through the gates of charity.

There is much unused power in the medical profession in this country, some of which might surely be devoted to educating the public to understand the importance of human conservation. Resolutions of societies and well-meaning presidential addresses, unassisted by organized effort, will probably get no farther than to illustrate the infant death rate of good intentions.

The physician witnesses the growth and the unmaking of men in a way that others do not. He sees that simple, wholesome living produces healthy and effective lives. He sees untrained and therefore incompetent men and women struggling in a bad environment, becoming prematurely old, octogenarians at forty. He sees children who are underfed and dwarfed in mind and body repeating later in their own incompetence the incompetent lives of their parents.

We doctors have in the main been carrying on an ambulance service in the past, that is, we have been picking up the injured. It has been a great work unequaled by any other human agency. It has, however, been a partial service, in that it has dealt mainly with results and has achieved relatively little in the way of prevention. This was unavoidable as it has been only within the past few decades that our knowledge of the obscure sources of many diseases and degeneracies has permitted the formulation of a general plan for health conservation that would accomplish such results as are today possible.

PLAN FOR CONSERVATION OF HEALTH NEEDED

A conservation plan should be much more than one to prevent contagious diseases or even to prevent all disease. It should be a plan for human reconstruction in the broadest sense, not alone for cripples or for defectives, but for rebuilding the bodies of all the people, beginning with childhood and not necessarily ending with completed growth. Such a plan should be administered by the government. The business of the profession will be to secure the adoption of a plan. It will require the united efforts of physicians acting in every community to educate the people and show them what human conservation means. Unless the general public can be convinced of the necessity for it, the government will be slow to put a constructive program in force.

The large number of our young men who could not pass the examination for the army during the recent war furnished convincing evidence that there is in this country a great deal of poor physical development. It is, too, quite possible that some defects were overlooked, but certainly enough were exposed to show the physical vigor of Americans

is not what it might be or what it ought to be. The fact that so much degeneracy was shown to exist in persons of the ages of those examined, would indicate that there are others older and others younger who are equally at fault physically. The humiliating revelations of these army examinations are an admonition to the country to see that the boys and girls of our day have the training that will enable them to meet successfully the tests of active life.

There is fortunately a growing interest in the medical profession in preventive measures which is reflected in activities of various states and in that of the general government. The health work in cities, the community nursing, the follow-up work of dispensaries and hospitals, the new interest in housing one of the biggest of human problems, these and many other activities are educating the public for the comprehensive program that will some day come.

NATIONAL HEALTH PLAN

We have also in recent years been moving toward a national health plan in the activities of the marine hospital service, the work of the Surgeon-General's Office and the annual health lectures provided by the American Medical Association. The next step should be a comprehensive plan for the entire country. It is not possible nor necessary to suggest a scheme here, but if the profession could induce congress to appoint a medical commission to investigate the need for a health program, such a body could easily produce evidence of the necessity for it and secure action.

BEGINNING OF PREVENTIVE MEDICINE

There is no finer chapter in medical history nor one that is more significant than that which records the first achievements in prevention of disease. When the genius of a country doctor connected the milkmaid with the cow, and devised prevention by vaccination, he took the first step toward doubling the usefulness of our profession by showing that some diseases may be prevented. What Jenner demonstrated was not only a matter of science but a social fact of great importance. The prevention of disease earlier received an impetus from the old Venetians when they put the word quarantine in the dictionary. They might have waited until the plague had developed in the city and then have administered their remedies; they preferred prevention.

SOCIAL LOSS FROM DISEASE

Eleven thousand young men applied for the Naval Reserve in 1913 and only 316 were found physically fit. It has been said that these tests are severe. They are. Should the United States lower its

standard to fit our degenerate youth or should we raise the physical level of our manhood? These tests are probably not higher than those any normal young man should be able to pass.

The annual social loss from disease is equal to the destruction of a great war. This is all the more regrettable, because most of it is preventable. It is a serious thing that there are more than 500,000 deaths from preventable diseases in this country every year, 400 times the number that were lost on the Titanic, a tragedy that shocked the world. Three hundred thousand babies die before they are a year old, a loss of which the figures are a poor measure. More people die before the fiftieth year in the United States now than in the time of our grandfathers, though in several European countries more people live beyond the fiftieth year than was the case two generations ago.

Ripley says that of 100 Jewish babies born in Massachusetts, fifty will be alive at the end of seventy years. Of 100 babies other than Jews born in Massachusetts, fifty will be dead in forty-seven years. Why is there this difference of twenty-three years under essentially the same environment? Is it due to a more intelligent care of health and a better scheme of life?

There are said by school authorities to be 500,000 feebleminded children in the public schools of this country, and it is probable that there are several times that number in the adult population. These morons breed true to the laws of degeneracy in families of ten and fifteen children. Where will this country find room for the 2,000,000 or 3,000,000 degenerates of this class that we will have two generations from this time? Has this Association ever called public attention to the danger that the feebleminded may pollute the healthy blood of this nation?

Man seems to be the hardest of all animals to kill. Human beings will survive mistreatment that would kill pigs and cows. If a man kills another with an ax or a pistol, he is punished; if he should kill a man with a slum house, he is not punished, though the men who rent slum houses are so much more dangerous that men with axes and pistols are relatively harmless creatures. The owners of slum houses help to fill our hospitals with sick and insane, and in addition they furnish a large supply of degenerates who prey on society. A general plan of health conservation should remedy these and other like conditions that cause much of the disease we see in public hospitals and much of the degeneracy that we meet outside of them. These cases of disease are the natural drift from such sources as bad housing and its many attendant evils that are spreading like an epidemic not only in cities, but on farms and in villages. Such insanitary homes with their inadequate care of children are the causes of much stunted growth,

incompetence and disease. Here also only a comprehensive program of health conservation can correct these evils.

No discussion of this subject could properly omit mention of our educational system: While the government plan of health conservation could not be made to apply to education in the states, it could by suggestion and advice make health conservation in all the states the first consideration in education. Indirectly, therefore, a government plan would determine that the states did their duty.

HEALTH CONSERVATION SHOULD BEGIN IN PUBLIC SCHOOLS

If we are to prevent physical degeneracy, or rather if we are to stop that which is now going on, we must begin with the children in the public schools. Their health should not only be guarded, but the training of their bodies is quite as important as the training of their minds. This should appeal to the intelligence and public spirit and the essential loyalty of every physician, less, however, as a medical practitioner, than as a man who understands or ought to understand the importance of medical sociology. Every man and woman who walks the streets today is essentially a product, physically and mentally, of our schools. Has our educational system been a success — if not, why not?

The power and much of the genius of a nation depends on the health of its citizens, and the preparation for effective living and national achievement should be made chiefly during the growing period. These little folks who are the raw material of our future citizenship are naturally outdoor animals. Their mental activity is founded on physical activity. Our schools will never be organized on the proper basis until we recognize and put in practice the fundamental principle that physical training should be the foundation of mental training.

Every medical man should have an immediate interest in existing methods of education, and especially in the conditions under which those methods are applied, and of all physicians the specialist in nervous and mental diseases should have the greatest interest. Any one of the younger specialists of this Association could go into any public or private school today and select with an approximation to accuracy a pretty large group of pupils who will probably be his patients or his contemporaries' patients fifteen or twenty years from this time. He will need to interpret the significance of the nervous attitudes of the children, the instability of nerve centers shown in the facial expression and in the general irregular muscular movements and other familiar signs of imperfect development. One sees in these cases the results of half-starved nerve centers, and neglected muscular activities, struggling in vain for normal expression in a turmoil of wasteful effort.

Hundreds of thousands of young people are yearly going out into the world unprepared for life because their only training in school, if training it may be called, has been a system based on word symbols. There is little or no discipline for young people in the unrealities of books; they cannot connect them with life, for to them life is in doing. The failure that so many of them experience in after years is also due, in large degree, to a lack of proper physical development. From the bad mental training and the neglect of the body there results much retardation, mental stagnation and physical disability, which make incompetents of many and invalids of others, while a few, through the miracles that nature daily performs, get into the small class of successful people.

The commission appointed by the National Educational Association says in a recent report that it would focus secondary education on the great social objectives, and it places the health of the young at the head of the list. This is encouraging for our teachers as a class have been slow to recognize, if indeed they do recognize, the important fact that health and sanity and success in life depend more on good physical development than on all the book knowledge that has been or can be packed into the healthily rebellious minds of the young. It is true that manual training and kindred instructions is given in certain schools, but it has not reached the great mass of boys and girls of this country.

It is a fundamental fact in human development that young people have a positive hunger for doing things, for learning as the race learned, to *think by doing*. The greatest discovery man has made to date was the first tool he fashioned. It was the chief means of the early development of the race, and so deeply is this primitive talent planted in the brain that every psychiatrist knows that the ability to do things is one of the last faculties lost. In teaching the young how to use the hands, the teacher is leading them over the long way the race came; the teacher helps them to short-circuit the race process. In this way even a dull boy can be taught to do some one thing well, and such training will save many from the failure that has condemned thousands to insanity, crime or pauperism.

Any physician who has seen much of the insane in public institutions must have been impressed with the large number of this class whose mental disorder, where the basic cause could be explained, has been chiefly due to the fact that they had never learned to do any one thing well. The dullards and incompetents that come from our public schools would, if they could speak, tell a tragic story of the failure of the educational side of our social system.

RESPONSIBILITY OF MEDICAL PROFESSION FOR CONSERVATION OF HEALTH

It is an important truth that nothing stands alone in this world, not even a medical association. We go up or down together. We are here today not solely because we are physicians, but also for the reason that society created us as a profession because it needed us, and we are therefore always serving its purpose. Our most private work is really a social and public work, so that in all we do we are going on the errands of society. Each one of us is an essential part of this moving human order that keeps society together and holds humanity to its sober tasks.

The world is passing into a new era. Though wars cease and the harsher strifes of men may disappear, the old struggle will go on under other forms which in the long run will be quite as destructive. Again the final test is the individual test, for in last analysis the reserve power of a nation rests on the ability of men and women to endure stress.

We cannot say that race decay has not already begun among the people of this country. There is much evidence that it has begun. No race nor nation, not even our own, can ever be free from the conditions that produce degeneracy. These are inherent in every form of human organization. They are all the more dangerous for being subtle and obscure in operation. They may act through generations lowering the resistances of individuals and families, and in widening circles a nation becomes involved.

Every medical association and every society should do systematic educational work with the public in the interest of a human conservation program. Medical men should not be willing to leave to others the credit or the task of leading in this movement, which is specifically a social duty of physicians. The profession owes it to society and to its own character as a scientific and progressive body to demand that the health and physical vigor of the men and women of the nation be cared for by the nation, and raised to the highest standard. For this, or any association of specialists, to take official notice of this subject, I realize would be a departure from custom. Departures from custom, new activities, are generally highly beneficial. They furnish stimulating experiences and a new form of spiritual exercise that is needed by the best of men and even by associations. They take the individual into bracing altitudes; they have been tonics to the social body in many an invalid period. All advance has been due to departures, that is, to new views, and new ideals that in all ages have set men's thoughts in higher and better ways. It has been such departures that have roused the inquiring, pioneering spirit that has led to great discoveries and kept men moving toward new horizons.

In this period of industrial and social reconstruction when all intertests are becoming intertwined, when human interspaces grow smaller, and new relations create problems that change our views of life and society, it is necessary that the medical profession also make certain readjustments, that it annex human interests to its older activities, if its members are to maintain its fine traditions and keep step with social progress.

All professional life is beset by the danger of a certain bias which habits of work in any special line tend to create. We humans are made of malleable material and we are likely to be moulded to a rather definite shape by our occupation, all the more likely because the process is unconscious. It is not easy to resist the common tendency to become set in certain habits and ways of thinking, with the result of lessening of general interests, a limiting of intellectual curiosity and growth, which cause many men to atrophy on some of the best sides of character.

Society needs now, and needs more than ever before, men who answer to that severest test of character — the ability to grow. Not the linear growth that is in the direct way of men's daily work and which is a relatively easy process; men are needed who are capable of lateral growth, who recognize the new human borderland of interests that increasingly demand attention. It needs men who take the social view of their work, who understand the individual and social value of life and see the importance of increasing that value.

The people of this country do not appreciate the need of human conservation; they have not been told as only doctors could tell them that it is necessary and urgent. Shall we wait and allow society finally to lead, or shall we take the wider view of our mission, and become the pioneers of a great constructive movement?

And now permit me, gentlemen, to indulge my fancy.

Fifty years from this time a medical historian will refer to this Congress and the proceedings of this section. To make the record complete he may mention the poor performance of this presidential hour. I read what he will write: "At the opening of the neurological section the president omitted the subject of neurology and spoke on human conservation, though he did this rather apologetically, as though he were afraid of offending someone. Being, however, an elderly man and evidently a person of good intentions, he was listened to politely.

"After that time the medical profession went far beyond the feeble suggestions of the speaker, of 1919, and the American Neurological Association in particular recognizing the importance of medical sociology made itself famous by developing a plan that has achieved

astonishing results in fifty years. Briefly, the physique of the American people has been recreated since that time and they now are known as the most vigorous and virile and efficient nation in the world.

"The writer regrets to say that, after careful research, he has failed to find any record of the name or the fame, if he had any, of the president of the American Neurological Association of 1919."

CEREBROSPINAL FLUID IN EXPERIMENTAL COMPRESSION OF THE SPINAL CORD*

JAMES B. AYER, M.D.
Captain, M. C., U. S. Army
BALTIMORE

In 1903, Froin[1] published cases of compression of the spinal cord due to a variety of causes but especially to meningitis; spinal fluid obtained by lumbar puncture was yellow, clotted rapidly, and contained an excess of protein. Since then this fluid has been called the *syndrome de coagulation massive et de xanthochromie.* It was subsequently found in a much greater variety of conditions, but all exhibited the common characteristic of cord compression.

In 1910, Nonne[2] called attention to the significance of a moderate to considerable increase in protein content of the spinal fluid, without xanthochromia, increase of cells or clotting. This type of fluid was frequently found in the presence of cord compression in a large number of cases published from Nonne's clinic by Raven.[3]

In 1916, the writer and Viets[4] analyzed a number of personally observed cases, and from these and from the literature, concluded that the syndrome of Froin was almost pathognomonic of spinal cord compression, usually indicating either a considerable or a rapidly progressive compression. It was further concluded that Nonne's syndrome was suggestive of a lesser degree of pressure on the spinal cord, and so delicate a test was it found to be that in some cases in which cord compression was in doubt it was found to be the most significant sign obtainable.

EXPERIMENTS

Some experiments performed during the past year on cats are of interest on this subject.

1. *Method.*—Briefly, the method employed was to produce compression on the cord by means of paraffin in the epidural space; and

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* From the Army Neurosurgical Laboratory, Johns Hopkins Medical School, Baltimore, Md.

* Authority to publish granted by the Board of Publication, Surgeon-General's Office.

1. Froin: Gaz. d. Hôp. **76**:1005, 1903.
2. Nonne: Deutsch. Ztschr. f. Nervenh. **40**:161, 1910.
3. Raven: Deutsch. Ztschr. Nervenh. **44**:380, 1912.
4. Ayer, J. B., and Viets, H. R.: Spinal Fluid Findings Characteristic of Cord Compression, J. A. M. A. **67**:1707 (Dec. 9) 1916.

subsequently to examine the spinal fluid above and below the area of compression.

After some practice it was found to be possible to introduce an 18 gage needle into the epidural space at lower thoracic levels without piercing the dura. Through this needle, paraffin with a melting point of 55 C., was injected; usually 1.5 c.c. being employed. A little carbon flour was added to blacken the paraffin to aid in its subsequent detection. At desired intervals thereafter spinal fluid was obtained by lumbar puncture and by occipito-atlantoid puncture of the cisterna magna;[5] thus an opportunity was given to compare the fluids above and below the area of compression. Tests were performed as follows: Naked eye examination for color and clotting; precipitation with 95 per cent. alcohol for proteid, using similar quantities of spinal fluid from upper and lower subarachnoid space; cell counts and differential counts frequently. Unfortunately, the amount of fluid obtained is too little for determination of pressure or for quantitative protein tests.

The method is of advantage in giving compression of a more or less uniform degree, and in affording an opportunity to compare the fluid above and below this compressed area at known intervals of time. A disadvantage of the method is that it provides a type of cord compression not likely to be met with in man. A more important disadvantage is that after compression there is so little fluid in the lumbar sac, and that under such slight pressure, that lumbar puncture frequently yields only a drop or two.

2. *Symptoms.*—On coming out of ether, cats subjected to epidural injections usually show weakness in one or both hind legs, remaining in crouched attitudes and frequently dragging one leg. Seldom is complete paraplegia seen immediately after injection. On the day following, symptoms are usually more marked, with evident weakness of both hind legs, though rarely to the same degree. Seldom is the paralysis complete at any time in either limb, though infrequently complete paraplegia occurs. Sensation from pinching the leg or pricking the skin is almost always preserved.

Subsequently the paraplegia persists for weeks or tends to improve; at times, great improvement is seen. Owing, however, to the paralyzed condition it is difficult to keep these cats in good general condition and they frequently die in one or two weeks.

3. *Pathologic Findings.*—Following injections as outlined, the blackened paraffin is found in the epidural space closely molded to the

5. Wegeforth, Ayer, and Essick: Am. J. M. Sc. **157**:1919.

dorsal aspect of the dura to a depth of from 1 to 3 mm. and extending along the dura for a distance of from 5 to 9 cm. Laterally, it thins out and is seldom seen over the ventral surface.

On removal of the paraffin, the cord, as seen through the dura, appears a little swollen, as indicated by its size and the loss of its finer markings. It is of a brownish tint and vessels appear, in the recently injected cases, abnormally prominent, not only at the site of compression but in the lumbar region below.

Microscopic examination shows at the levels of compression a mild cellular infiltration of the meninges. In recently injected animals this consists of polymorphonuclear cells, together with considerable serum and some free blood; in long-standing cases the exudate is made up of large mononuclear cells, some of which are phagocytic, together with lymphocytes and plasma cells. In neither type are organisms seen. The spinal cord shows no distortion, but may appear a little large. It seldom presents abnormality of gray or white matter as seen by hematoxylin and eosin or toluidin blue staining methods. Neither in gross or on microscopic examination is there evidence of burning of the tissues from hot paraffin.

4. *Examination of the Cerebrospinal Fluid.*—In nine cats in which paraffin was successfully injected, spinal fluid examinations showed in lumbar fluid the following:

GROUP 1.—Three cats show the Froin syndrome (in part or complete).
GROUP 2.—Four cats show the Nonne syndrome.
GROUP 3.—Two cats show normal fluids.

Spinal fluid above the area of compression, obtained by occipito-atlantoid puncture at the same time, invariably gave normal or relatively normal findings.

GROUP 1.—All of the cats showed almost complete paraplegia within twenty-four hours after injection; and punctures were made within forty-eight hours. The following protocol is from one of this group:

CASE 1 (1064).—Aug 14, 1918—11:20 a. m.: 1.5 c.c. paraffin (melting point 55 C.) injected into lower thoracic epidural space. Five p. m.: almost total paralysis of hind legs; cries out if tail is pinched.

August 15—9 a. m.: Can just waddle with hind legs. Reflexes lively.

Lumbar puncture yields two drops of yellow fluid which clots in the needle. With stylet a little is forced into 0.5 c.c. 95 per cent. alcohol, and a considerable white precipitate forms.

From *cisterna magna* is obtained 1 c.c. of slightly blood tinged fluid which does not clot and gives only a faint precipitate with alcohol. Both fluids show a few polymorphonuclear leukocytes and large mononuclear cells.

Sacrificed same day. Gross examination shows an almost continuous layer of blackened paraffin over dorsal aspect of dura from C_3 to L_2; paraffin appears

thinned out over lateral aspects of dura and only a little appears ventrally. The cord is obviously under tension as shown by transverse depressions corresponding to vertebral contours. The color is normal except for a few small hemorrhages, superficial but under dura. Microscopic examination shows a well marked but moderate polymorphonuclear exudate in the meninges, together with some serum and some free blood. No organisms. In the cervical region above the paraffin there is a very slight polymorphonuclear infiltration of the meninges. Cord substance appears normal.

The following case is of greater interest because the cat lived for nine weeks and numerous tests were made upon the spinal fluid.

CASE 2 (1065).—August 14—11:30 a. m.: Cat injected with 2 c.c. of paraffin in lower thoracic epidural space. Five p. m.: Partial paraplegia. Next day: Can just walk, hind legs very stiff. Tests of spinal fluid today show the Froin syndrome. (Compare table.) For nine weeks animal continued to show an awkward and stiff gait until, following ether and puncture, it died on October 17.

RESULTS OF TESTS OF THE SPINAL FLUID

Date	Lumbar Puncture				Occipito-Atlantoid Puncture			
	Amount of Fluid	Character of Fluid	Clot	Proteid	Amount of Fluid	Character of Fluid	Clot	Proteid
August 15	2 drops	Not determined	Clotting in needle	++++	1 c.c.	Blood tinged	No clot	+
September 7	0.5 c.c.	Slightly blood tinged	No clot	+	0.5 c.c.	Clear colorless	No clot	Slt. +
September 11	0.3 c.c.	Slightly blood tinged	No clot	++	.....	Clear colorless	No clot	Slt. +
September 17	1 c.c.	Bloody fluid	No clot	++	.....	Clear colorless	No clot	Slt. +
September 26	0.5 c.c.	Clear colorless	No clot	+	0.5 c.c.	Clear colorless	No clot	Slt. +
October 5	1 c.c.	Almost clear	No clot	+	1 c.c.	Almost clear	No clot	Slt. +
October 17	0.8 c.c.	Almost clear	No clot	Slt. +	0.5 c.c.	Clear colorless	No clot	Slt. +

Tests as follows: The amount of proteid is expressed relatively; "slt +" represents normal precipitation with alcohol—all others pathologic, ++++ being a massive precipitation.

At the time of obtaining the last fluids, with both needles in situ a little Locke's solution was introduced into the cistern, and with the slightest pressure it appeared promptly at the lumbar needle, thus showing at this time the continuity of the subarachnoid space.

Examination shows paraffin mass extending over the dorsal aspect of the dura from C_4 to filum. The dura is nowhere abnormally tense, but root markings as seen through it are a little obscure. There is no distortion of cord. Microscopic examination shows arachnoid membrane seemingly adherent to inner surface of dura. In the arachnoid meshwork are numerous mononuclear cells. In the gray matter of cord an occasional phagocytic cell is seen, but nerve cells and white matter appear otherwise normal.

These two cases show early the Froin syndrome in the lumbar fluid. In the latter case, subsequent examinations show a change to the picture described by Nonne, and later to normal. Cells were studied in the above fluids; during the earlier punctures a number of polymorphonuclears and lymphocytes was found, both above and below the area of compression, but later disappeared almost entirely from both fluids. Except where definite blood contamination was noted, red cells were not conspicuously present.

GROUP 2.—Of the four cats in this group, paralysis was less marked than in cases of Group 1, except in a single one. A protocol from this group is given:

CASE 3 (1098).—August 20—11:20 a. m.: Epidural injection of paraffin 0.3 c.c. followed in two minutes by 0.5 c.c. (Two separated injections given in an unsuccessful attempt to more closely localize the pressure.) Five p. m.: Somewhat spastic in hind legs—otherwise well. August 21: Does not use right hind leg much; it is kept forward under belly. Left hind leg stiff. 10:30 a. m.: Lumbar Puncture: Six drops of almost clear, colorless fluid shows numerous polymorphonuclear and mononuclear cells and a few red corpuscles. Proteid test strongly positive. Occipito-Atlantoid Puncture: 0.5 c.c. clear; rare cell; almost no proteid.

September 4—L. P. and O. A. P. fluids both clear. Protein—slightest possible trace in both. No white cells—rare red corpuscles in lumbar fluid. Animal remained spastic in hind legs until a third test was performed. September 10—L. P.: 0.5 c.c. slightly blood tinged fluid. Proteid—correct amount for blood present. O. A. P.: 0.5 c.c. clear; almost no proteid. September 11, sacrificed.

Gross examination shows paraffin in epidural space for a distance of 9 cm.; in its thickest portion 3 mm. deep. No microscopic examination.

This experiment shows in the condition of a moderate degree of paraplegia an initial lumbar fluid with marked but not excessive content, which subsequently becomes normal.

GROUP 3.—Two cats showed normal spinal fluids even with the pressure of paraffin in the epidural space. In both of them, however, paraplegia was of a slight degree; and in one the test was not made until long after the infection (on the 19th day), at a time when the fluid of similar cases was shown to have become normal.

SUMMARY AND DISCUSSION

It has been possible to inject with paraffin the epidural space in cats. Symptoms of partial transverse myelitis, manifested chiefly as incomplete paraplegia, have resulted.

In these cats the spinal fluid obtained from below the area of compression usually differs greatly from that above; the former shows almost constantly greater protein content, is usually scanty in amount,

at times is of a yellow color, and at times clots rapidly and completely; the fluid taken from above is uniformly and relatively normal.

These abnormal fluids are readily grouped into two classes, corresponding to the syndromes of Froin and of Nonne, recognized clinically to be characteristic of cord compression. As in man, the fluids which clot and contain the greater amounts of protein are found in the cases showing greatest symptoms of pressure. It has also been clinically observed that agents which rapidly produce compression of the spinal cord are those most likely to give the complete syndrome. In our experiments the injection of paraffin produces sudden compression; the well marked fluid changes recorded must have been promptly brought about, in that they were often demonstrated by tests made twenty-four hours later.

It may be thought that the abnormal findings are due to hemorrhage into the subarachnoid space incident to the injection. This is unlikely because normal fluids contaminated with an equal amount of blood either do not clot at all or yield at most a filmy clot; nor does the protein content in such fluids compare in amount with these. The protein associated with the mild aseptic meningitis present in these cases is also relatively insignificant, as demonstrated by the fact that the fluid obtained from the cisterna magna may contain white cells equal in number to those from the lumbar region, but shows only slight increase in protein. That these fluids may be in some manner caused by burning of the tissues from the hot paraffin is not the case, because a few experiments in which an amount of paraffin was injected insufficient to cause compression paralysis failed to cause changes in the lumbar fluid.

We see in some cases a well marked vascular engorgement of the pial vessels below the area of compression. We see also an abnormal amount of serum in the subarachnoid space at the level of compression. It is reasonable to think that transudation into the lumbar sac, as maintained by Mestrezat (page 448),[6] is the pathologic process operative in the formation of these fluids so rich in protein.

CONCLUSIONS

1. Paraffin may be injected into the epidural space in cats, with resultant compression of the cord and symptoms of incomplete transverse myelitis.

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6. Mestrezat: Le Liquide Cephalo-Rachidien, normal et pathologique, Paris, 1912.

2. Spinal fluid obtained from below the area of compression usually shows marked increase in protein content, at times is yellow and clots spontaneously. The greater the amount of protein the more likely is the fluid to clot.

Fluids obtained from the subarachnoid space above the area of compression are invariably normal or nearly normal.

3. The pathologic fluids obtained are entirely comparable with (1) the *syndrome de coagulation massive et de xanthochromie* of Froin, and (2) the syndrome of Nonne—both characteristic of spinal cord compression in man.

A CLINICAL SURVEY OF 415 INSTANCES OF BRAIN, SPINAL CORD AND PERIPHERAL NERVE INJURIES, AS SEEN IN OVERSEAS WOUNDED

WITH REPORTS OF SEVERAL UNUSUAL CASES *

J. C. FISK, M.D. (NEW YORK CITY)
Captain, M. C., U. S. Army

AND

SAMUEL BROCK, M.D. (NEW YORK CITY)
First Lieutenant, M. C., U. S. Army

U. S. ARMY BASE HOSPITAL, CAMP MERRITT, N. J.

The cases constituting the basis of this report were studied at the U. S. Army Base Hospital, Camp Merritt, N. J., during the period from December, 1918, to March, 1919. As this institution evacuated the wounded to hospitals of the interior, the treatment given these patients during their brief stay was of a temporary nonsurgical nature. As a consequence, no therapeutic deductions were made from the treatment applied to this group of cases. The tables appended (Tables 1, 2 and 3) give a detailed analysis of the cases.

The 415 instances occurred in 328 patients, 76 of whom had two or more lesions. Of these multiple injuries, which occur with much greater frequency in lesions of the upper extremities, the commonest combinations are analyzed in Table 2.

These cases have been examined at this hospital, on an average of from three to five months after the original injury was sustained; therefore, a sufficient length of time has elapsed to allow of the completest evolution of the lesion. On the other hand, in certain brain and cord injuries (namely, aphasias and hematomyelias) a marked degree of recovery has been attained in that period of time; in such cases, history and field cards have corroborated the diagnosis.

PERIPHERAL NERVE INJURIES

In Tables 1 and 2 it will be noted that three columns have been drawn — one to indicate complete severance and loss of function of the nerve; a second, to indicate incomplete severance, contusion, concussion or commotio of the nerve, with incomplete loss of function, and a third, those cases of an incomplete nature, in which the pain or

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* Authority to publish granted by the Board of Publication, Surgeon-General's Office.

TABLE 1.—Statistical Data on 415 Nerve Injuries

Nerve Involvement	Complete Involvement	Partial Involvement	Neuritis Causalgia	Total
Brachial plexus	2	7* 2	5	16
Root lesions	3	..	..	3
Cord lesions—				
Outer	1	..	..	1
Inner	5	..	..	5
Posterior	..	2	..	2
Median	35	27	8	70
Ulnar	43	24	8	75
Musculospiral	37	12	4	53
Radial (term. cutan. branch of musculospiral)	8	..	..	8
Internal cutaneous	8	1	1	10
Circumflex	4	..	..	4
Musculocutaneous	3	3	..	6
Long thoracic	1	..	..	1
Nerve to rhomboids	1	..	..	1
Nerve to posterior axillary muscles	1	..	..	1
Total	152	78	26	256
Sciatic	12	4	5	21
Small sciatic	2	..	1	3
External popliteal	33	6	1	40
Internal popliteal	1	4	1	6
Posterior tibial	4	3	4	11
External cutaneous of thigh	3	..	..	3
Internal saphenous	2	1	2	5
External saphenous	1	..	..	1
Anterior crural	..	..	2	2
Total	58	18	16	92
Cranial Nerve Injuries—				
Olfactory	..	..	..	0
Optic	6	1	..	7
Oculomotor	2	3	..	5
Trochlear	..	..	..	0
Trigeminal	..	4	..	4
Nerve to external rectus	1	1	..	2
Facial	4	7	..	11
Auditory	2	2	..	4
Glossopharyngeal	..	..	..	0
Vagus	..	1	..	1
Spinal accessory	..	2	..	2
Hypoglossal	1	1	..	2
Total	16	22	..	38

* Commotio of plexus with residual lesions.

TABLE 2.—The Most Common Combinations in Multiple Lesions

Nerve Involved	Complete Involvement	Partial Involvement	Neuritis Causalgia	Total
Median and ulnar	9	8	2	19
Median and musculospiral	1	..	..	1
Ulnar and musculospiral	1	1	..	2
Median, ulnar and musculospiral	5	3	1	9
Median, ulnar and internal cutaneous	3	..	..	3
Median and radial	3	..	..	3
Median, musculospiral and internal cutaneous	1	..	..	1
Median, ulnar and radial	1	..	..	1
Total	24	12	3	39

causalgia have been of predominating severity. In the column of "partial involvement" are also included those cases in which only the sensory or motor components of a mixed nerve have been involved.

In regard to peripheral nerve injuries, comparison of our statistics with those of recent English writers (namely, Burrow and Carter,[1] and Stewart and Evans[2]), reveals on the whole a close correspondence; certain discrepancies, however, require comment. These authors have found brachial plexus injuries more commonly than we have; namely, Burrow and Carter, 77 out of 1,000 cases, and Stewart and Evans, 61 out of 316 cases.

TABLE 3.—BRAIN INJURIES—SECONDARY TO FRACTURED SKULL

Brain Injuries—Secondary to Fractured Skull—	
Aphasias (motor and sensory) partial	7
Hemiplegias	4
Paraplegias	1
Astereognosis (injury to superior parietal lobe left)	1
Occipital lobe injuries (with hemianopsia)	2
Posttraumatic (fracture) psychosis	1
Total	16
Spinal Cord Injuries—	
Hematomyelia (concussion)	4
Cauda equina	3
Conus terminalis	1
Cervical sympathetic palsy	1
Segmental lesions:	
Cervical	1
Dorsal	0
Lumbar	1
Sacral	2
Total	13

In studying the histories of the severer injuries of the upper arm and shoulder, commotio of the brachial plexus has been noted very often. In fact, the great majority of men sustaining severe wounds of the upper arm and shoulder give a history of a fairly complete sensory and motor paralysis of the corresponding arm, occurring directly after the injury. This paralysis quickly improves; many finally achieve complete restoration of function, others show residual sensory and motor lesions.

In their combined total of 1,316 cases, circumflex nerve involvement occurred twice, whereas, in our series four instances are recorded, three of which occurred singly. Our one case of long thoracic nerve involvement (associated with a commotio of the branchial plexus) and our one instance of involvement of the nerves to the rhomboidei, find no parallel in their series. Of our ten lesions of the internal cutaneous

1. Burrow, J. LeF., and Carter, H. S.: Preliminary Note on Investigations on 1,000 Consecutive Cases of Peripheral Nerve Injury, Brit. M. J. **2**:535 (Nov. 16) 1918.

2. Stewart, Purves, and Evans, Arthur: Nerve Injuries and Their Treatment, Oxford Medical Publications, 1916. (These authors give statistics on 316 cases of nerve injury.)

nerve only one occurred singly, that is, unassociated with the other lesions. Of the six musculo-cutaneous lesions, five occurred associated with other nerve injuries.

LESIONS OF THE LOWER EXTREMITIES

In contrasting lesions of the lower extremities, interesting comparisons arise in regard to sciatic nerve injuries. Burrow and Carter record 121 out of 1,000 cases; Stewart and Evans, 21 of their 316 cases; we have had 21 in our series of 415 cases. In regard to external popliteal involvements, the former English authorities record 97 out of their 1,000 cases, the latter 26 of their 316 cases; we have had 40 instances. Many sciatic injuries quickly resolve themselves into partial or complete involvements of the external popliteal branch, a fact commented on by Stewart and Evans. The internal popliteal escapes with an incomplete involvement, which, as emphasized by Hammond,[3] shows a marked tendency to recovery without special treatment.

As a consequence, we believe that not a few of our external popliteal involvements were really incomplete sciatic lesions in the beginning.

The English authors quoted do not record any instances of involvements of the external cutaneous nerve of the thigh; we have observed three such lesions. On the other hand, to the ten instances of anterior crural nerve involvement which their series of 1,316 cases reveal, we can only add two incomplete involvements with neuritis.

While neuromas on the whole are not frequently met with in peripheral nerve injuries, the great majority that are felt occur in the course of the median and ulnar nerves in the upper arm; a few are palpated along the course of the sciatic nerve in the thigh.

The cranial nerve injuries tabulated require no particular comment.

The clinical and symptomatological minutiae of the various nerve injuries are omitted in this paper; for such detailed clinical descriptions reference may be made to the excellent works of Mme. Athanassio Benisty,[4] Tinel,[5] and Stewart and Evans.[2]

BRAIN INJURIES

It is beside the purpose of this paper to go into the subject of brain injuries, concerning which such a vast literature has already arisen.

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3. Hammond, T. E.: The Involvement of the External and Internal Popliteal Nerves in Lesions of the Sciatic Nerve, Brit. M. J. **1**:397 (April 6) 1918.

4. Benisty, Mme. Athanassio: The Clinical Forms of Nerve Lesions (English translation), Military Medical Manuals, University of London Press, Ltd., 1918.

5. Tinel: Les Blessures des Nerfs, Masson et Cie, Paris, 1916.

Two very interesting cases coming under our notice, however, deserve mention.

ILLUSTRATIVE CASES

CASE 1 (J. H., Infantry Sergeant).—*Diagnosis: Cerebral concussion (laceration?) following severe head trauma (fracture of the base of the skull?).*

The prolonged period of amnesia—the auditory aphasia, the sudden and peculiar changes in conduct characterized by the attacks of antagonistic behavior and negativism (posttraumatic psychosis), together with the partial loss of memory, the attacks of vertigo, tinnitus, restlessness, severe headaches, and the concentric contraction of the visual fields, all denote a diffuse cerebral injury involving especially the left temporal and occipital lobes, and optic paths. Such a complex grouping of symptoms and signs renders the case of especial interest.

History.—The patient has served ten years in the U. S. Army with a good record. He was admitted to the U. S. Army Base Hospital, Camp Merritt, N. J., Feb. 11, 1919; when examined, February 19, he talked freely and gave a fairly connected history of one year's foreign service. In July, 1918, he was gassed twice. On July 15, 1918, at Chateau-Thierry during a bombardment he was severely shocked with high explosives, and was "blown up twice"; during the second explosion he came down and hit his head, but was not rendered unconscious; he was dazed and suffered from loss of speech and hearing at this time. Later that day while being taken prisoner, he was severely beaten about the head with the butts of the German guns, and from the history of others, bled from nose, mouth and ears, at this time. The patient has no recollection of anything that occurred from July 15 to early September, but the history shows that he had numerous outbreaks of irritability while in a German prison camp, getting into fights with the German prison officers and attendants.

The first indication of return of memory occurred early in September, 1918; he remembers being able to talk, "but not well"; he could see, but the letters had to be very large. At that time he was unable to understand spoken language; it was necessary to put everything in writing. Since that time the patient has gradually improved, but he has had attacks of loss of memory, preceded by vertigo, constant ringing, loud noises in both ears, mental confusion, restlessness, severe headaches, and throbbing at the temples, terminating in profuse sweating and marked weakness. Some of these attacks were associated with mental derangement. On Feb. 19, 1919, the patient while being subjected to a Bárány test, had a violent propulsive seizure, and would have fallen heavily had he not been caught. There was no past-pointing. This reaction seemed to upset him greatly, and he felt very badly for several days.

Neurologic Examination.—Motor: Negative. Gait negative.

Sensory: Negative.

Reflexes: Knee jerks, double plus; Achilles, plus; arm reflexes, plus.

Cranial Nerves: Pupils equal, react to light and accommodation. Slight nystagmus to left. Fundi: pale, outline distinct, no signs of neuritis. Hearing, apparently diminished, but the behavior of the patient suggested at this time that his difficulty in understanding was an aphasic difficulty rather than due to an inherent defect in hearing. After answering numerous questions, the patient's behavior underwent a remarkable change; he became suddenly indifferent, refused to answer, looked down, and became sullen and irritable. Further examination discontinued until February 24, when the patient was seen in the ward smoking a cigar. He refused to talk, dropped his head, seemed

quite annoyed, and was markedly negativistic. After several attempts to get him to talk he arose from his chair, advanced toward the examiner, and made an attempt at assault. He was finally quieted and told to sit down, which he did. He rested his head on a table, and then began to move it with a jerky, lateral movement, becoming quite prostrated.

On March 1, the patient was much improved, talked freely, stating that he had no knowledge of the previous visit of the examiner, in fact, he said that he had never seen the examiner before. He was surprised when told that he exhibited an antagonistic attitude on the last examination. He stated that he was subject to such outbreaks, and that "his nerves were all gone," that he cannot remember, and does not sleep well.

Examination March 6: Patient not so well, spoke freely; he remembered the examiner, and some of the conversation of the last visit. Orientation, judgment and insight good. Marked concentric contraction of visual fields; photophobia; marked tinnitus complained of, worse in left ear. Hearing not diminished. His vocabulary is very limited, his speech slow, and he mixes his words. Before answering, he repeats the questions asked of him. No dysarthria. Memory: very distinctly amnesic, with complete blotting out of certain memories. Patient shows evident psychic exhaustibility; at first he conversed very well, but toward the end of the examination, he exhibited marked evidences of mental fatigue. The patient himself notices this, remarking, "if you keep at me too long, I can't think at all."

Roentgenogram.—This reveals no evidences of fracture of the skull.

Results.—The general behavior of the patient indicates that he has considerable difficulty in understanding spoken language. He makes no attempt to reply to questions until he advances close to the examiner, and watches the latter's lips very carefully; he then replies only after repeating the question asked. (This represents an effort to correct his auditory aphasia.) This is in contrast to his spontaneous speech which is comparatively fluent and connected. Patient's emotional behavior is now of a distinctly humorous turn.

CASE 2 (W. G.).—*Diagnosis: Injury to cervical cord following fracture of left transverse processes of sixth and seventh cervical vertebrae; cerebral thrombosis, left, following ligation of external carotid artery in the neck (thrombus, ascending in the internal carotid artery).*

This case is of especial interest in the unusual combination of lesions presented. Due to the cervical cord injury, we have a flaccid spinal monoplegia (left upper extremity) with sensory changes and a left cervical sympathetic paralysis with ptosis and miosis. On the other hand, incident to the cerebral thrombosis, and involvement of the vascular channels supplying the left sensory-motor areas, and motor speech center of Broca, there developed a motor aphasia, with right sided hemiplegia, hemihypesthesia, hemihypalgesia, right sided loss of muscle sense and partial astereognosis.

History.—A cerebral hemiplegia (with motor aphasia) on one side, and a spinal monoplegia with associated sympathetic palsy on the other, is certainly a rare combination. Shrapnel injury of left side of neck was sustained Sept. 28, 1918. Such a severe hemorrhage occurred at the site of injury that ligation of the external carotid artery on the left side became necessary. Two hours after the operation a right-sided hemiplegia and hemianesthesia supervened, more marked, however, in the upper than in the lower extremity. Loss of speech, with loss of power and numbness of left arm and ptosis of left upper eyelid, and miosis of left pupil also appeared.

Neurologic Examination (Dec. 15, 1918).—This revealed the following:

Motor: There is weakness of right arm, and to a lesser extent, the right leg. A marked weakness exists in the left arm, but none in the left leg. Grips: left, weak; right, weak (but stronger than left). No atrophy of definite muscle groups. Gait: slightly hemiplegic on right. Some spasticity of right hand and arm. Limitation of forward movements of cervical spine.

Sensory: Hypesthesia, hypalgesia, loss of muscle sense, and partial astereognosis noted in right upper extremity, more marked in the distal part. Sensation of right lower extremity, normal. Hypesthesia and hypalgesia present in the upper extremity—more marked than on right side. There is tenderness of seventh cervical spine.

Reflexes: Knee jerks: right, double plus; left, normal. Achilles: right, active; left, normal. Babinski present on right. Arm reflexes: right increased; left, normal.

Cranial Nerves: There is a left partial ptosis, associated with a pupillary miosis. Fundi: white patches of choroidal atrophy present in both eyes adjacent to the disks. Speech: A distinct paraphasia is present which apparently is the residuum of the previous motor aphasia. There is considerable difficulty in pronouncing "g's," "p's," and "c's" (dysarthria). Memory shows marked defect.

Roentgen-Ray Findings (Dec. 28, 1918).—Loss of bony tissue in the region of the left transverse processes of the sixth and seventh cervical vertebrae.

SPINAL CORD INJURIES

As will be noted in Table 3, four cases of hematomyelia are recorded. In view of the late work of H. Claude and J. Lhermitte,[6] the propriety of designating these cases as "hematomyelia" is seriously questioned. These authors, in a recent article describing similar injuries in the French soldier, emphasize the factor of concussion in the production of the pathology and classify their cases as (*a*) *Indirect Conclusion:* This results from the explosion of shells of large caliber at a distance producing marked variations in atmospheric pressure; the individual affected is not struck by the missile. (*b*) *Direct Concussion:* (1) Immediate — in which the missile passes through the body of the vertebrae, or fractures the transverse or spinous processes, and (2) mediate — in which the missile passes through perispinal tissues or impinges on neighboring bones, so producing concussion of the cord tissues.

Both in the mediate and immediate types of direct concussion, the clinical syndromes produced are identical; all degrees and grades of pathologic phenomena may be brought about in these two types of direct concussion. The French authors[7] emphasize the absence of

6. Claude, H., and Lhermitte, J.: Les Commotions directes de la Moelle Epiniere, Presse Med. **26**:514 (Oct. 7) 1918.

7. Claude, H., and Lhermitte, J.: Etude clinique et anatomique de la Commotion directe de la Moelle Epiniere, Ann. de Med. 2:479 (Nov.) 1915.

hemorrhage in these direct concussion cases, and refer to the pathology in the cord as one of necrosis of nerve cells, axis-cylinders, and myelin sheaths, affecting the white fibers much more than the gray matter, and involving the central canal and posterior roots often to a remarkable degree. Neuroglia, vascular and other connective tissue elements show active proliferation. The following patients (Cases 3 to 8) are examples illustrative of the direct type of concussion, although tabulated by us in part as instances of hematomyelia. It will be noted that Cases 3, 4, 5 and 7, represent the immediate types of direct concussion, whereas Cases 6 and 8 illustrate the mediate variety.

CASE 3 (I. S.)—*Diagnosis: Injury to fifth dorsal segment of spinal cord following fracture of lamina of fifth dorsal vertebra and the right transverse processes of sixth and seventh dorsal vertebrae.*

The trauma produced a paraplegia with bladder and rectal disturbances, which recovered to a remarkable degree and sensory changes, which were of the dissociated type seen in syringomyelia. This case not only illustrates the great degree of recovery attainable in these cases, but also shows how the brunt of the pathologic process may be borne by the tissues about the central canal of the cord.

History.—Gunshot wound, July 21, 1918, penetrating right side and back of chest with comminuted fracture of sixth and seventh ribs, with injury to fifth and sixth dorsal vertebrae.

Previous examinations made abroad give the following data (from soldier's field card) July 29, 1918: "Paraplegia: right side, complete; left, nearly so. Roentgen ray reveals foreign body above left scapula, nearly subcutaneous. Fracture of eighth rib at entrance wound; fifth, sixth and seventh ribs near the spine. Fracture of transverse process, right side dorsal sixth and seventh vertebrae. Fracture lamina of fifth dorsal vertebra. Bladder and rectal control not lost, but disturbed. Hydropneumothorax present."

Aug. 18, 1918: "Power returning in legs; bladder and rectum the same. Incontinence of urine and feces, anesthesia of urethra, bladder, and rectum of two months' duration."

Neurologic Examination (Feb. 20, 1919).—This revealed the following:

Motor: No weakness of lower extremities. Gait, normal.

Sensory: Complete thermo-anesthesia, hypesthesia and analgesia below the level of fifth dorsal cutaneous segment with retention of deep sensation, except over buttocks, where there are two areas (islands) of retained heat sensibility. (Dissociation of sensation.)

Reflexes: Both knee jerks quite exaggerated. Patellar clonus on left side. No ankle clonus. Babinski and Oppenheim present on both sides. Although analgesic, when stuck with a pin, a marked motor reflex occurs in extensor muscles of both thighs, showing irritability of pyramidal tracts. A very slight Romberg. Marked *cutis anserinus* present, ephemeral in character.

Cranial Nerves: Negative.

Roentgen-Ray Findings (Feb. 23, 1919).—There is a comminuted fracture through the sixth and seventh ribs near the vertebral ends on the right side, with fractures of the transverse processes of the fifth and sixth dorsal vertebrae. There are some small fragments of metal near the fifth rib.

CASE 4 (E. M.).—*Diagnosis: Injury of the cauda equina, following fracture of the fifth lumbar vertebra.*

This produced a paraplegia with bladder and rectal disturbances, pains and tenderness along the sciatic nerves (descending neuritis) and a bilateral segmental loss of sensation in the entire sacral distribution. In this case the recovery attained is not as pronounced as in the preceding one. The presence of tenderness along the left sciatic nerve indicative of a descending neuritis is of especial interest.

History.—Gunshot wound in lower back sustained Oct. 14, 1918, followed by paralysis and numbness of lower extremities, retention of urine and marked constipation, associated with anesthesia of rectum, urethra, and bladder. After a period of two weeks, partial return of vesical and rectal power together with return of power in flexors and extensors of both thighs occurred; return of sensation also made its appearance on anterior aspect of both thighs. With numbness and paresthesia, shooting pains radiated down both sciatic nerves, the latter persisting on the left side. Movements of toes and dorsiflexion of feet, especially right, then partially returned. Loss of power of erection persisted for three months.

Neurologic Examination (Feb. 14, 1919).—This revealed the following:

Motor: Atrophy of glutei, calf, anterior tibial and peroneal muscles on both sides; weakness more marked on left side. Bilateral weakness of dorsi-flexors of feet especially marked on left side, producing partial bilateral "drop-foot." Gait, typically "steppage."

Sensory: Anesthesia and analgesia in cutaneous distribution of all sacral segments; anesthesia of urethra, bladder, and rectum. The first and second sacral segmental areas show irregular patches of return of sensation, more marked on right side; left sciatic nerve tender.

Reflexes: Abdominal, active and equal. Cremasteric, active and equal. Knee jerks, right, active; left, diminished. Achilles, both lost. Upper extremities normal.

Roentgen-Ray Findings.—The fifth lumbar vertebra shows a fracture of the left side of its body with a loss of bony substance 2½ by ½ cm., without dislocation or compression.

CASE 5 (A. L.).—*Diagnosis: Injury to cauda equina following fracture of the fifth lumbar vertebra producing a syndrome of greater severity than in the instance of the preceding case. Paraplegia, muscular fibrillations, bilateral segmental loss of sensation in the sacral distribution of an assymetrical nature, associated with trophic disturbances in foreskin and glans penis, are present. The descending neuritis in the sciatic nerves is very severe, occupying a prominent place in the clinical picture.*

History.—Sustained a shrapnel wound of the fifth lumbar vertebra in September, 1918, following which he developed paralysis and numbness in the entire left leg and thigh, muscular twitchings in both legs and thighs, and retention of urine and feces. About ten days later, urinary incontinence took the place of retention. He gradually improved, was able to walk, and was sent back to this country.

Neurologic Examination (Feb. 1, 1919).—This revealed the following:

Motor: Atrophy of the muscles of both buttocks (glutei) especially left; atrophy of left hamstring muscles. Marked muscular twitchings in muscles of both thighs and legs, and also to a lesser extent in the muscles of the arms and forearms.

Sensory: Touch, deep pressure, pain and temperature absent in the cutaneous distribution of the left sacral 2-3-4-5 and coccygeal 1 segments, and in the cutaneous distribution of the right sacral 3-4-5 and coccygeal 1 segments. This involves the penis and the left half of scrotum, which are anesthetic and analgesic. The right half of the scrotum is hypesthetic. Trophic disturbances are manifested in foreskin and glans penis. There is anesthesia of rectum, bladder and urethra.

Hyperesthesia and hyperalgesia of skin along spinal column up to the level of the cervical spine. Sharp pain radiating down both thighs and legs into soles of both feet occurs, much more severe on the left, on which side it is associated with marked dysesthesia. Pressure along left calf and thigh is productive of severe pain.

Reflexes: Knee jerks, equal and active. Both Achilles absent. Upper extremities exagerated.

Cranial Nerves: Negative. Incontinence of urine and persistent constipation present.

Roentgen-Ray Report (Feb. 4, 1919).—There is a piece of shrapnel 2½ cm. long and 1 to 1½ cm. wide resting above the left sacro-iliac joint. The bone is apparently normal beneath. Another small fragment 1 cm. long and ½ cm. wide is located 1 cm. from the left border of the fifth lumbar and first sacral vertebrae. There has been some bone destruction on the left border of the body of the fifth lumbar vertebra, and a piece of bone about 1 cm. long is missing. This destruction of bone lies almost directly above the location of the smaller foreign body; there has been a deposit of inflammatory tissue about this area. There is no other evidence of fracture of this vertebra and no compression present.

CASE 6 (R. P.).—*Diagnosis: Injury to conus terminalis producing the "conus terminalis syndrome."*

The bilaterally symmetrical ano-genital anesthesia (sacral fourth and fifth segments) with complete retention of urine, occasional fecal incontinence, sexual impotence, together with the absence of pain and quick disappearance of fibrillations make for a clean cut clinical picture.

History.—Sustained gunshot wound Sept. 6, 1918, entering left hip, passing across region of first and second sacral vertebrae, emerging at right hip. At the time of injury, partial paralysis of both legs, with muscular twitchings of lower extremities—retention of urine, loss of rectal control, and loss of power of erection occurred.

Neurologic Examination (Dec. 31, 1918).—This revealed the following:

Motor: Walking slow and difficult; gait, straddle-legged and paretic, though no actual paralysis. Muscular twitchings have disappeared.

Sensory: Anesthesia and analgesia of penis, scrotum, perineum, bladder, urethra and rectum; also, a band of anesthesia extending around the lower abdomen and the inner aspect of thighs, above which was an area of hyperesthesia. The sensory changes are symmetrical. Except for constant backache, no pains are complained of.

Reflexes: Knee jerks, equal and active. Cremasteric, present, left greater than right. Abdominals, equal and active. Upper extremities, normal.

Cranial Nerves: Negative. Complete retention of urine, necessitating catheterization, present together with marked constipation, and occasional fecal incontinence.

Reexamination (Jan. 11, 1919): Examination at this time revealed:

Motor: No change.

Sensory: Area of anesthesia diminishing; and limited to the cutaneous distribution of the fourth and fifth sacral segments on both sides. Hyperesthetic areas above first lumbar regions still present.

Reflexes: No change.

Retention of urine, persistent constipation with occasional fecal incontinence, impotence, and anogenital anesthesia still present.

Roentgen-Ray Examination.—Reveals no injury of bones of lower spine.

CASE 7 (R. M.).—*Diagnosis: An unusual case of concussion (hematomyelia?) of cervical cord, produced by injury to the spinous processes of fifth and sixth cervical vertebrae.*

The involuntary, painful, muscular contractures of the fingers, the atrophy of the muscles of the upper extremities, the dysesthesiae and parasthesiae, and other sensory and trophic disturbances, all of a symmetrical nature constitute a very interesting and rare syndrome. These irritative manifestations are dependent, we believe, on lesions of the posterior roots and columns, pyramidal tracts and anterior columns of a partially destructive nature.

History.—Gunshot wound of neck sustained in October, 1918. The missile entered the left side of neck, passed horizontally across the median line, emerging at a corresponding point on right side, the scars of injury being on the level of the spinous process of the fourth cervical vertebra.

Following the injury, the patient suffered a complete motor paralysis of upper and lower extremities and a sensory paralysis of the upper extremities; the lower extremities gradually regained their motor power.

Neurologic Examination (Dec. 21, 1918).—This revealed the following: Marked tenderness to pressure over the fifth and sixth cervical vertebrae over which spinous processes there is a loss of the usual bony contour. The superficial fibers of both trapezii have been severed. Lateral movements of head restricted and painful. A marked, painful flexor contracture of fingers of both hands present, producing an involuntary clenching; the palms show as a consequence the imprint of the finger-nails. He complains of marked tenderness of skin of hands, of paresthesiae, and of severe painful cramps in muscles of hands.

Motor: Weakness of both upper extremities, more marked distally; especially flexors of forearm and intrinsic muscles of hands with consequent limitation of the finer movements of fingers and hands. Atrophy of muscles of both shoulders, arms, forearms and hands; grips, weak—left weaker than right. No fibrillary twitchings; a fine rapid tremor of hands is present; the contractures are noted above.

Sensory: Skin of hands very tender and intolerant to cold; areas of dysesthesia, hypesthesia, hypalgesia and thermohyperesthesia of hands and forearms. Trophic: skin pink, glossy and dry. Astereognosis: left complete, right partial.

Reflexes: Deep reflexes of lower extremitities, normal. Upper extremities, left arm, increased; right arm, normal.

Cranial Nerves: Pupils contracted, outline regular, light reaction diminished. Fundi show marked congenital conus.

Roentgen-Ray Findings.—There is destruction of spinous processes of fifth and sixth cervical vertebrae. The bodies of the vertebrae are apparently normal. The ligamentum nuchae has been partially severed.

CASE 8 (A. W.).—*Diagnosis: Injury to cervical and dorsal cord (cervical fifth to dorsal second segments) following gunshot wound of neck.*

In this case there is no evidence of direct (immediate) injury to the vertebral column and yet the concussion of perispinal tissues was transmitted to the cord in such a violent manner as to produce a distinct segmental injury (C_5 to D_2) which manifests itself in the muscular atrophy of the left shoulder group, in a left sympathetic ptosis and myosis (which disappeared) and in a Brown-Séquard syndrome involving the left half of the cord in the cervico-dorsal region.

History.—Shrapnel wound of left side of neck sustained Oct. 1, 1918, situated behind the posterior border of sterno-mastoid muscle of left side, 3½ inches below the tip of the mastoid process, producing loss of power of left arm, leg, and partial loss of power of right leg with loss of sensation of right side of body, including arm, leg, and trunk. He was not unconscious, but there was considerable bleeding from the wound. At this time there was also noticed a drooping of his left upper eyelid, and a contraction of the left pupil. Twenty hours after the injury the patient was operated on and a piece of shrapnel, with particles of clothing were removed; following the operation loss of voice and dysphagia appeared (injury of left recurrent laryngeal nerve) Five days later wound culture showed *Bacillus welchii* and nonhemolytic streptococci.

Patient progressively improved and was finally sent back to this country. He was admitted to U. S. Army Base Hospital, Camp Merritt, N. J., Feb. 21, 1919, suffering from marked dyspnea; examination then showed such edema of larynx and glottis that a low tracheotomy had to be performed; prompt relief followed.

Neurologic Examination (Feb. 23, 1919).—This revealed: A purulent discharge from the operative wound which now evidently communicated with the tract of the missile; subcutaneous emphysema noted in both supraclavicular spaces. Lateral movements of head limited and painful; tenderness over spinous processes of cervical vertebrae.

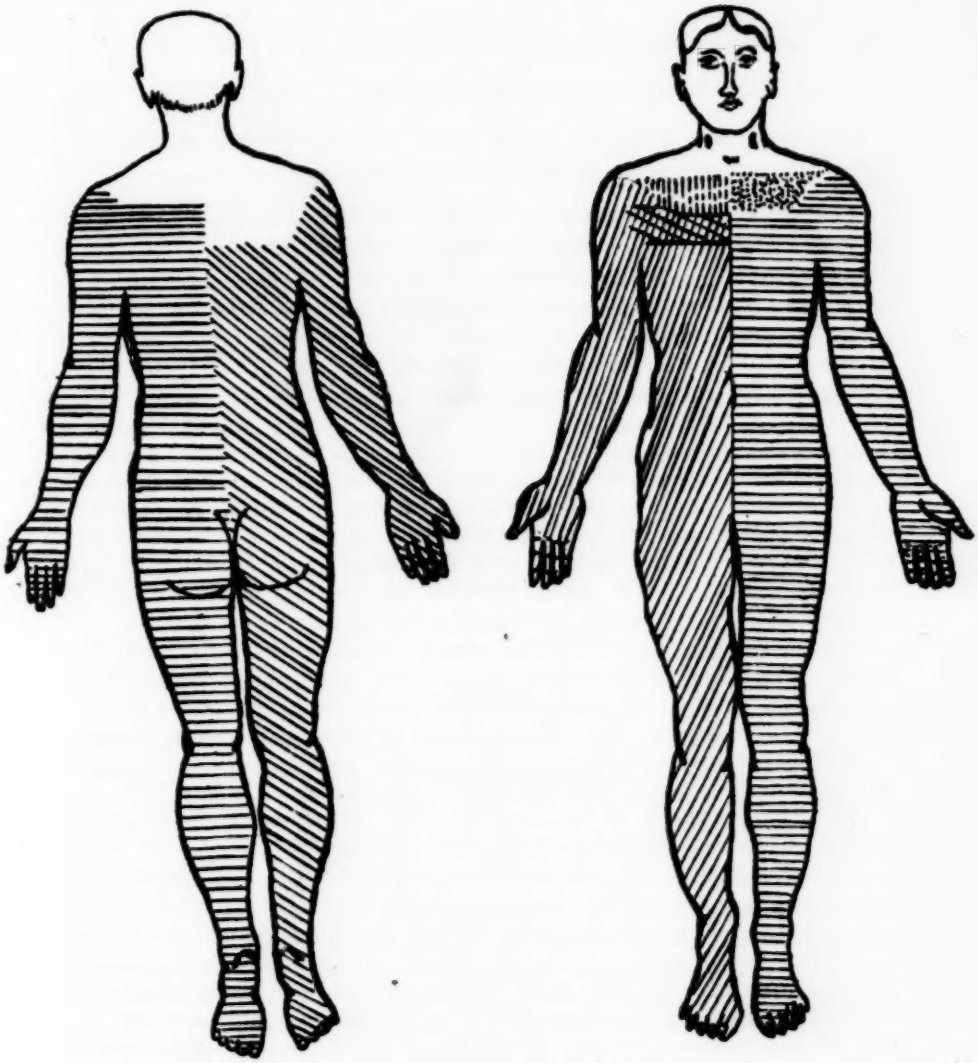
Motor: Weakness of left arm (especially muscles of shoulder group) and of left leg. Right upper extremity, normal; right lower, weak. Grips: left, weak; right, normal. Considerable atrophy of left supraspinatus, infraspinatus, deltoid, biceps, pectorales, trapezius, and to a lesser degree, of the muscles of left forearm and hand. Some weakness of both lower extremities, not enough to prevent efficient locomotion.

Sensory: Refer to the accompanying chart.

Reflexes: Knee jerks: right, active; left, double plus. Achilles reflex, right, active; left, double plus. Ankle and patellar clonus present on left, on which side there is also a Babinski. Biceps and triceps are normal on the right, but increased on the left. Abdominals and epigastrics, normal on the right, absent on the left.

Cranial Nerves: Negative. Left sympathetic ptosis and pupillary miosis now gone.

Roentgen-Ray Findings.—This was negative for bony changes in cervical spine (March 20, 1919). Pain and temperature sense have returned on the right side, down to the level of the fourth intercostal space.



Illustrating sensory changes in Case 4.

1. Area of hypesthesia; deep sensation retained.

2. Area of analgesia, thermo-anesthesia and hypesthesia; the hypesthesia is less marked on this side.

3. Area of thermohypesthesia, hypalgesia and hypesthesia.

4. Area of thermohypesthesia, hyperalgesia and hyperesthesia.

5. Area of thermohypesthesia. Areas 3, 4 and 5 not well differentiated on back.

FUNCTIONAL CASES

Herewith are presented three cases of a functional nature, each peculiarly interesting in certain of its features.

CASE 9 (N. B. M.).—*Diagnosis: Concussion of lumbar cord producing a paraplegia with sensory changes and bladder disturbances.*

As the organic lesion was recovering, a functional condition developed, characterized by clonic tic-like movements of face and upper part of body, emotional instability, headaches, left sided hemianesthesia, hemianalgesia, and "glove and stocking" anesthesia and analgesia on the right side.

History.—This patient was "blown down" while in a barrage and fell headlong into a shell hole, producing marked hyperextension of his spinal column. Following this he was dazed and his lower extremities felt numb and paralyzed; he was unable to move them for about ten days, when motion gradually returned. Incontinence of urine was present and has persisted. It consists of an inability to control the flow. There is no retention or loss of bowel control. The patient also complained of a dull constant pain in the lower back, with radiations of a sharp nature encircling the abdomen, at the level of the iliac crests, and also stiffness of lower extremities.

Neurologic Examination (Dec. 19, 1918).—This revealed the following:

Motor: Great difficulty in walking noted, due to pain and stiffness of back.

Sensory: Irregular areas of hypesthesia and hypalgesia over entire body; a band of hyperesthesia in lower dorso-lumbar region extends around the trunk.

Reflexes: Knee jerks, equal but diminished. Achilles, present and equal. Pupils, irregular—react to light and accommodation.

The spinal column is so rigid that he cannot bend over. He complains of marked restlessness, headache, vertigo, and poor vision.

Subsequent Examination.—More recently, since the latter part of December, 1918, clonic irregular, tic-like movements of neck and shoulders occur. These movements are much worse on emotional excitement, hearing noises, etc. He is still subject to headache (whereas formerly he was quite immune); he is emotionally unstable, weeping readily. His speech is quite hesitating, whereas formerly he was able to discourse freely. Facial grimaces and movements occur now, whereas formerly they did not. He complains of "specks" before his eyes, and cold feet quite frequently.

Ten years ago he had an attack of "nervous prostration," which lasted over a period of six months; he was confined to his bed for the first six weeks. The attack was ushered in by unconsciousness, associated with muscular movements of an involuntary nature on the right side of body, and partial loss of memory. He finally made a good recovery.

Reexamination (*Jan. 22, 1919*).—Examination at this point revealed the following:

Motor: He walks with a shuffling, spastic gait, holding his back quite rigid. No muscular atrophy or hypertonicity.

Sensory: Complete *left-sided* hemianesthesia and hemianalgesia.*

On *right side* anesthesia and analgesia of lower extremity up to groin, and of lower third of right forearm and hand. Tenderness in lower back.

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* Along inner sides of both legs there remains a longitudinal, narrow area of retained sensation.

Reflexes: Knee jerks, both diminished. Achilles present and equal. No Babinski or Oppenheim.

Final Results.—Later reports from U. S. Army General Hospital No. 1, New York, to which this patient was transferred, indicate that he has almost entirely recovered from his functional disturbances.

CASE 10 (J. W.).—*Diagnosis: Hysterical monoplegia, with "glove" anesthesia and analgesia associated with a homolateral hemihypesthesia and hemihypalgesia following a gunshot wound of left forearm.*

This case illustrates the "fixing" of a hysterical monoplegia by a gunshot wound of the same limb.

History.—Gunshot wound of left forearm, 3½ inches below the elbow, sustained July 21, 1918.

Neurologic Examination (Jan. 20, 1919).—This revealed a functional paralysis of all the muscles of the left forearm and hand; all electrical reactions preserved; no demonstrable organic nerve lesion. Slight degree of atrophy (disuse) in muscles of left forearm and hand. Complete "glove" anesthesia and analgesia to 1½ inches above site of wound, associated with which there exists a left hemihypesthesia and hemihypalgesia.

CASE 11 (J. G.).—*Diagnosis: Hysterical "glove" anesthesia and analgesia following a trivial injury (gunshot wound) of the little finger of the left hand.*

The interest in this case centers about the fact that as the sensory changes began to disappear, the area of anesthesia remaining very closely simulated the cutaneous sensory distribution of the ulnar nerve in the hand.

History.—This soldier gives a history of having been gassed and "shell shocked" before sustaining a gunshot wound of the little finger of the left hand on July 15, 1918; this injury was very evidently of a trivial nature. The history shows that for six weeks after the injury there was a complete "glove" anesthesia and analgesia to above the left wrist. This gradually cleared up.

Neurologic Examination.—When examined by us Feb. 6, 1919, the functional area of anesthesia remaining very closely simulated the sensory distribution of an ulnar area of organic origin. A complete left hemihypesthesia and hemihypalgesia was also present. He complains of insomnia, headaches, partial loss of memory and general nervousness, with inability to stand excitement or hear noises "without jumping."

THE COLLOIDAL GOLD REACTION IN FOUR HUNDRED AND NINETY-EIGHT PSYCHIATRIC CASES*

EVA RAWLINGS, M.D.
MENDOCINO STATE HOSPITAL, CALIFORNIA

The following report is an analysis of the colloidal gold reaction in 498 cases of various psychoses in which there was suspected a nervous syphilis from the clinical findings of pupillary changes, exaggerated or lost reflexes, speech defects, histories of early cardiovascular involvement or apoplexies; with miscarriages, still births, defective mental development or more frank syphilitic manifestations in the immediate relations. No case was punctured which did not show either a positive Wassermann reaction of the serum with suggestive neurological symptoms, or neurological symptoms which made dependence on a negative serum inadvisable. The colloidal gold reaction is of special interest in regard to the reliability of the test as a means of diagnosis of syphilis when all other tests are negative and as a method of differentiation between general paralysis of the insane and cerebrospinal syphilis. Lange's original method was at first used, but later the modification of Miller and his colleagues of Phipp Psychiatric Clinic, Johns Hopkins, was substituted. No solution was employed which showed the faintest tinge of purple, brilliant orange-red solutions properly standardized being used. The Wassermann tests of serums and fluids were made by Dr. Sobei Ide in the laboratories of the Psychopathic Hospital, Ann Arbor, Mich. The spinal fluid was examined in the Kalamazoo State Hospital laboratories, the pleocytic count being a bedside count which we have found to be more reliable. The test for globulin is Nonne's Phase 1, checked up occasionally by the Ross-Jones modification. Other tests of the fluid were routinely made, but not recorded for the sake of brevity and clearness.

The disease types are grouped in order to facilitate conclusions in regard to the type of reaction which might be expected in definite disease entities, especially where neurological symptoms existed but a syphilitic infection was doubtful and yet impossible to rule out. A small number of the cases have been examined at necropsy and the nervous tissues worked up in the laboratories. They are mentioned in the group to which they belong.

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*From the Laboratories of the Kalamazoo State Hospital, Michigan.

TABLE 1.—General Paresis

Case Number	Wassermann Test		Cells	Globulin	Colloidal Gold
	Blood	Spinal Fluid			
15005	4	4	40	4	5555422100
15011	4	4	110	4	4443221000
15089	4	4	30	3	4444422200
15097	4	4	25	4	5555433210
15138	4	4	120	4	5555543200
15139	4	4	140	4	5555543311
15240	4	4	35	4	5555511110
15329	4	4	100	4	4444410000
15382	4	4	30	4	1112233100
15423	4	4	0	3	0002344110
15428	4	4	40	4	5555554432
15437	4	4	60	4	5555540000
15464	4	4	80	4	5544320000
15538	4	4	40	4	5544320000
15539	4	4	50	4	5544331100
15643	4	4	60	3	5544432000
15663	4	4	5	4	4443333200
15674	4	4	50	4	5555554300
15706	4	4	0	2	5554432000
15709	4	4	80	3	5554321000
15716	4	4	60	2	0023300000
15735	4	4	110	4	5544310000
15746	4	4	30	4	5544332200
15772	4	4	180	4	5533321000
15790	4	4	25	4	5555554300
15821	4	4	90	4	5555554321
15827	4	4	30	4	5555433210
16122	4	4	20	4	5555432000
16169	4	4	10	3	5555554320
16187	4	4	70	4	5555555310
16188	4	4	70	4	5555555410
16249	4	4	70	4	5555432000
16282	4	4	140	4	0112332100
16328	4	4	120	4	5544321000
16332	4	4	50	4	5555432100
16334	4	4	60	4	5555433321
16341	4	4	50	2	5554321000
16347	4	4	70	4	5553321000
16396	4	4	150	4	5555443210
16407	4	4	40	4	5555554320
16418	4	4	110	3	5554431000
16484	4	4	40	4	5555421000
16592	4	4	15	4	5555443200
16607	4	4	80	4	5555532100
16671	4	4	5	4	5554321000
16711	4	4	190	4	5554443211
16743	4	4	30	4	5555554210
16749	4	4	20	4	5555552100
16700	4	4	30	4	5555542100
16803	4	4	40	4	4444432110
16830	4	4	70	4	5555432100
16853	4	4	90	4	5555542110
16864	4	4	100	4	5555532100
16886	4	4	30	4	5554321000
14936	4	4	190	4	5555420000
15196	4	4	140	2	4555440000
16278	4	4	750	4	5555543320
15239	4	4	50	4	2343211000
14995	4	4	60	3	4422211000
15847	4	4	30	4	5555433100
16955	4	4	50	2	0123321000
15376	4	4	15	2	443322100
15386	4	4	50	3	334432100
15712	4	4	20	2	5544320000
15778	4	4	50	4	5555554210
15800	4	4	30	3	5555322000
17010	4	4	10	4	5555543200
16154	4	4	110	4	5544320000
16291	4	4	40	4	5554432000
16492	4	4	80	3	5543321000
16667	4	4	8	4	5554331000
16725	4	4	60	4	5544331000
14397	4	4	10	2	2221000000
16930	4	4	10	3	5554332100
16940	4	4	80	4	5555544331
17034	4	4	10	4	5555432100
16968	4	4	30	4	5555432110
15121	2	4	40	4	5555532111

TABLE 1.—General Paresis—Continued

Case Number	Wassermann Test		Cells	Globulin	Colloidal Gold
	Blood	Spinal Fluid			
15131	4	3	40	4	4444320000
15228	3	4	30	4	5555444430
15286	1	4	60	4	2334110000
15303	4	3	20	1	1111222210
15346	±	4	40	4	5554444000
15450	2	4	50	4	5554320000
15492	4	—	180	4	1111233111
15534	4	—	70	4	0000333210
15602	3	4	20	3	5555432100
15662	1	4	50	3	5554433211
15752	3	4	170	4	5555553200
15774	±	4	20	4	5555532100
16274	4	—	90	4	0112332100
16417	[illegible]	4	50	4	5555543100
16494	±	4	70	3	5544322100
16514	—	4	15	1	4455532100
16576	±	4	60	3	5433210000
16618	3	4	5	4	5555544320
16764	2	4	60	4	5555542110
16802	±	4	60	4	4555532100
16825	—	4	40	4	5555553210
15235	±	4	20	4	5555543100
16260	4	2	10	4	5555553200
16376	4	—	10	1	5543200000
16397	3	4	50	4	5555544320
16706	±	4	7	4	4444321100
15112	4	4	80	3	2233110000
15231	4	4	20	4	3444443200
15262	4	4	80	4	4442221000
15314	1	4	20	4	1123221000
15426	4	4	50	3	5544332100
15429	±	4	30	3	4443320000
15434	4	4	220	4	1112233321
15448	4	4	30	3	1123331000
16162	4	3	420	4	0011233210
16216	1	4	80	3	1232100000
16923	3	4	50	4	5544332100
17033	±	4	10	4	5543321000
16970	1	4	40	4	5555544331
17014	±	4	15	3	5554332100
16970	4	4	15	4	5555543210
15308	±	4	0	3	0000000000

Analyzing the general paresis group in which most consistent results have been obtained by various investigators, it is observed that, in the 120 cases examined, 96 gave typical paretic curves, of whom 78 showed correspondingly strongly positive Wassermann reactions of serums and spinal fluids with markedly positive globulin and pleocyte count. In the remaining eighteen cases there were variations in the Wassermann reactions and cell counts. Five cases gave a slightly atypical paretic curve, the reduction in the first one or two tubes being 4, then rising to 5 and following the normal curve; subsequent tests of similarly reacting fluids have frequently given typical curves, the variations being unaccounted for, and it has been our custom to consider them paretic, moreover the curves have been confirmed by necropsy. Thirteen cases gave syphilitic curves, four of which — Cases 15382, 16955, 15303 and 15492 — received treatment, and six — Cases 15112, 15314, 15434, 15448, 16162 and 16216 — were tabetic in type. Five cases gave atypical curves, among these Cases 15423, 14379 and 15534 had received treatment. One case which

had received treatment gave a practically negative reaction. Eight cases — 14936, 15112, 15774, 16278, 16334, 17010, 15196 and 15235 — came to necropsy and the diagnosis confirmed, Case 15112 being tabetic in type.

TABLE 2.—CEREBROSPINAL SYPHILIS

Case Number	Wassermann Test		Cells	Globulin	Colloidal Gold
	Blood	Spinal Fluid			
14831	—	—	20	2	2233220000
14516	±	4	100	2	0112322000
14546	4	4	210	4	1122330000
14808	4	4	30	3	1123110000
14971	4	4	40	3	0122210000
15087	4	4	10	2	1133221000
15099	—	—	6	1	1112332100
15100	—	±	0	—	1122210000
15310	4	4	50	4	2334443310
15332	4	4	50	4	1134411000
15333	2	4	20	3	1223332000
15414	4	4	350	2	1123321100
15467	4	4	20	4	1222233320
15622	4	4	30	4	0011221000
15672	—	—	80	2	0011233220
15680	4	3	10	1	0122100000
15721	3	—	20	3	0123310000
15734	4	4	30	1	2233320000
15764	—	—	0	1	1112221000
15780	4	—	0	0	0233211000
16033	—	—	5	1	1123320000
16037	—	4	30	4	0111233210
16178	4	4	20	4	4553332100
16280	—	±	0	2	0123210000
16335	—	4	30	3	0012321000
16365	—	—	10	1	0012210000
16370	4	—	3	2	0000000000
16390	—	—	0	2	0012321000
16394	4	4	310	2	0012321000
16425	4	±	20	2	1233110000
16443	—	—	3	—	0000000000
16460	—	—	5	2	0122100000
16461	4	4	50	2	1123321000
16512	—	—	0	1	0000000000
16529	2	—	0	—	0133100000
16564	4	4	110	4	0112333210
16566	—	—	15	3	1122211000
16582	—	—	0	1	0122100000
16609	4	4	40	4	1123321000
16658	2	4	40	4	0112332100
16665	—	—	10	1	0122210000
16689	4	4	20	3	0123210000
16707	—	—	10	4	1122110000
16710	—	—	2	—	0121000000
16733	4	—	?	—	0122100000
16742	4	4	120	4	1123321000
15470	3	2	50	2	0012331100
16815	—	—	10	1	0122100000
16823	4	1	10	2	1233200000
16857	—	—	0	2	0122100000
16938	3	—	0	—	0122100000
17029	—	—	5	1	0012100000
17017	—	—	0	3	0112110000
16922	2	2	3	1	0012110000
16951	—	—	10	3	0123321000
16954	4	4	210	4	0124432100
16962	—	—	0	1	0122100000
15711	—	—	3	1	0012210000
16523	—	—	10	1	0012210000

Among the fifty-nine cases of cerebrospinal syphilis, twenty-three gave syphilitic curves checked up by positive Wassermann reactions of both serums and fluids. Eleven cases gave syphilitic curves, eight of whom showed positive serums and negative spinal fluids and three positive fluids and negative serums. Twenty-three gave syphilitic

TABLE 3.—Arteriosclerotic Insanity

Case Number	Wassermann Test		Cells	Globulin	Colloidal Gold
	Blood	Spinal Fluid			
14619	—	—	6	—	0000000000
14954	—	—	0	2	0000000000
15050	—	—	0	—	0000000000
15057	—	—	0	—	0000000000
15062	—	—	0	1	0000000000
15132	—	—	0	1	2332110000
15142	—	—	0	1	0000000000
15157	—	—	0	2	0000000000
15190	—	—	0	1	1112110000
15202	—	—	0	1	0000000000
15214	—	—	0	—	0000000000
15255	—	—	12	1	0000000000
15315	—	—	5	1	0000000000
15326	—	—	0	—	0000000000
15365	—	—	0	—	0000000000
15395	—	—	0	—	0000000000
15589	—	—	5	3	1122210000
15616	—	—	40	2	0000000000
15626	—	—	0	1	0000000000
15628	—	—	0	1	0000000000
15724	—	—	0	1	0000000000
15726	—	—	0	1	0000000000
15804	—	—	3	—	0012210000
15809	—	—	0	1	0012332100
15822	—	—	5	1	0000000000
16103	—	—	3	—	0000000000
16115	—	—	3	—	0011221000
16128	—	—	80	1	0000000000
16134	—	—	10	—	0000000000
16172	—	—	0	1	0012100000
16189	—	—	0	1	0000000000
16199	—	—	5	—	0000000000
16200	—	—	10	3	0123210000
16208	—	—	5	3	0123210000
16232	—	—	5	3	0012210000
16233	—	—	3	3	0012210000
16237	—	±	5	2	0012221100
16238	—	—	0	2	0011211000
16246	—	—	3	4	0002232210
16248	—	—	20	4	0000000000
16279	—	—	0	—	0000000000
16298	—	±	0	—	0000000000
16306	—	—	40	4	0011223200
16318	—	—	0	1	0000000000
16361	—	—	10	—	0000000000
16395	—	—	0	1	0012210000
16412	—	—	5	1	0012211000
16432	—	—	2	1	0000000000
16462	—	—	0	1	0000000000
16500	—	—	0	—	0000000000
16507	—	—	0	4	0000000000
16509	—	—	0	1	0122210000
16516	—	—	0	1	0000000000
16518	—	—	15	—	0000000000
16522	—	—	10	2	0012110000
16544	—	—	10	1	0000000000
16551	—	—	3	1	0000000000
16572	—	—	0	—	0122100000
16591	—	—	15	1	0000000000
16601	—	—	0	3	0000000000
16608	—	—	0	2	0122100000
16613	—	—	10	—	0000000000
16615	—	—	10	—	0000000000
16659	—	—	0	1	0012100000
16669	—	—	5	1	0122100000
16674	—	—	5	—	0000000000
16709	—	—	8	4	0000000000
16712	—	—	20	—	0000000000
16714	—	—	10	1	0122100000
16722	—	—	20	—	0000000000
16730	—	±	0	—	0000000000
16737	—	4	0	4	0000000000
16774	—	—	0	1	0122100000
16784	—	—	0	2	0000000000
16792	—	—	10	1	0000000000
16807	1	—	0	—	0122100000
16870	—	—	10	1	0123210000

TABLE 3.—ARTERIOSCLEROTIC INSANITY—Continued

Case Number	Wassermann Test		Cells	Globulin	Colloidal Gold
	Blood	Spinal Fluid			
16875	—	—	5	1	0000000000
16894	—	—	10	—	0000000000
16899	—	—	0	—	0000000000
16934	—	—	3	1	0122210000
16957	—	—	10	1	0012110000
16763	—	—	20	1	0000000000
16943	—	—	0	—	0000000000
16947	—	—	0	—	0000000000

curves with negative Wassermann reactions of both serums and spinal fluids; clinically, these cases were largely arteriosclerotic in type with sluggish or absent pupillary reflexes, diminished or absent knee jerks, histories of early vascular involvement, symptoms of visceral syphilis, frequently a history of infection or of abortions and stillbirths in the wives, the cases being classed in the syphilitic group more on the clinical histories than on the syphilitic curve. Five of these—Cases 16365, 16460, 14831, 15711 and 16523—came to necropsy and showed, pathologically, well-marked evidence of an old endarteritis, syphilitic in type, of the brain vessels with evidence of visceral syphilis. Two cases gave negative reactions with negative serums and fluids, being placed in this class entirely on their clinical histories. The cell counts in seven cases were 100 and over, the average count being rather low for this form of syphilis though this may be due to the fact that the endarteritic type of the disease largely predominated. The acellular form of cerebral syphilis occurred chiefly among those having negative Wassermann reactions.

The arteriosclerotic group of eighty-five cases showed twenty-nine giving syphilitic curves with negative Wassermann reactions of the serums and spinal fluids. These cases lacked sufficiently convincing clinical histories pointing toward a syphilitic involvement to warrant classing them in the cerebral syphilis group on the gold curve alone. Fifty-six cases gave negative gold reactions, among whom one case gave a mildly positive Wassermann reaction of the serum and one a $++++$ fluid. This latter case should have received another test. Cases 15202, 15255, 16189, 16875, 16507 and 15062 were given a necropsy examination, the first five confirming the gold curve. The last showed an old pathologic condition of the cerebral vessels highly suggestive of syphilis.

Among the forty-eight defectives, syphilitic curves were given in fourteen, negative reactions in thirty-three and paretic in one—the last showing fifteen cells, $++++$ globulin reaction and negative Wassermann reactions of serum and spinal fluid. The group was

composed of morons, imbeciles and idiots with epilepsy, periods of disturbances, hysterical episodes or drug addiction. In Case 16339 the patient was suffering with alcoholic hallucinosis. The positive syphilitic curves in this series are of special interest from the fact that a fairly large number of the defectives in the institution in whom an acquired syphilis could with a moderate degree of certainty be ruled

TABLE 4.—Defectives

Case Number	Wassermann Test		Cells	Globulin	Colloidal Gold
	Blood	Spinal Fluid			
14638	—	—	5	—	0000000000
15026	—	—	0	—	0000000000
15033	—	—	0	—	0000000000
15048	—	—	5	1	0000000000
15213	1	—	5	2	1122100000
15265	—	—	0	—	0000000000
15305	—	2	0	—	0000000000
15373	—	—	5	2	0000000000
15483	—	—	5	—	0000000000
15494	—	—	0	2	0000000000
15514	—	—	0	—	0000000000
15648	—	—	10	—	0000000000
15658	—	—	5	—	0000000000
15745	—	—	0	1	0000000000
15787	—	—	0	—	0000000000
15793	—	—	0	—	0000000000
15816	—	—	0	—	0000000000
15982	—	±	30	1	1123210000
16139	—	—	0	—	0000000000
16193	—	—	0	—	0000000000
16305	—	—	5	1	0012111000
16313	—	—	5	1	0012110000
16339	—	—	5	4	0000000000
16374	—	—	0	—	0000000000
16398	—	—	0	—	0000000000
16399	—	—	0	—	0000000000
16409	—	—	10	1	0012110000
16457	4	—	0	1	0112110000
16583	—	—	40	—	0000000000
16603	—	—	10	2	0012321000
16692	—	—	2	1	1121100000
16731	—	—	3	—	0000000000
16171	—	—	15	4	5555532000
16192	—	—	10	2	0000000000
16288	—	—	0	—	0000000000
16323	—	—	10	—	0000000000
16333	—	—	5	1	0112210000
16350	—	—	8	—	0000000000
16753	—	—	0	—	0000000000
16772	—	—	0	—	0000000000
16805	—	—	10	2	0122110000
16617	—	—	0	1	0122210000
16672	—	—	5	—	0000000000
16834	—	—	0	1	0122100000
16890	1	—	0	1	0012110000
16892	—	—	0	—	0000000000
16925	—	—	0	3	0122110000
16296	—	—	0	0	0000000000

out have shown the physical stigmata of a syphilitic germ infection rather than a germ damage as seen in the diminished or lost reflexes, cerebral palsies, hydrocephalus, etc., and yet have uniformly given negative Wassermann reactions of the serums and spinal fluids. In a number of these cases there have been demonstrated at necropsy evidences of cerebral endarteritis, diffuse scleroses, fibrous meningitis and pachymeningitis, porencephaly, etc., suggestive of a syphilitic

etiology, and we have been forced to draw the conclusion that after the active process dies out there is an increasing tendency in the later adult years to a progressive disappearance of the antibodies in the body fluids with negative reactions. It is therefore possible that the syphilitic reactions obtained in these cases may be of diagnostic value on account of the extreme sensitiveness and apparent specificity of the gold solution. Unfortunately, none of the present series of defectives came to necropsy and those on whom the above conclusions were drawn were not subjected to the gold test.

TABLE 5.—MANIAC-DEPRESSIVE PSYCHOSIS

Case Number	Wassermann Test		Cells	Globulin	Colloidal Gold
	Blood	Spinal Fluid			
14063	±	—	3	4	0112100000
14229	—	?	40	4	1112334400
14557	±	—	10	—	3321100000
14857	4	—	15	—	0000000000
15028	—	—	20	—	0000000000
15192	1	—	0	—	2221110000
15207	—	—	8	—	0000000000
15257	4	—	5	—	0000000000
15267	—	—	5	2	4433310000
15292	4	—	0	2	0000000000
15309	1	—	0	1	0000000000
15336	—	—	20	2	1112223330
15378	—	—	5	1	0000000000
15407	—	—	160	2	0123332000
15480	—	—	0	—	0000000000
15639	—	—	0	—	0000000000
15701	±	—	5	—	0000000000
15718	—	—	0	—	0000000000
15725	—	—	0	—	0000000000
15747	±	—	6	—	0000000000
15755	—	—	0	1	0012000000
16076	—	1	4	1	0000000000
16100	—	—	20	4	0012211000
16119	—	—	3	—	1112210000
16138	—	—	0	2	0011210000
16259	—	—	10	1	0012210000
16303	—	—	0	—	0122100000
16324	—	—	0	—	0000000000
16467	3	—	0	—	0000000000
16535	—	?	?	—	0000000000
16573	—	—	5	2	0000000000
16586	—	—	10	—	0000000000
16626	—	—	0	—	0000000000
16682	4	—	10	4	0122100000
16686	—	—	5	1	0000000000
16687	—	—	3	1	0000000000
16762	—	—	0	3	0122210000
16777	—	—	0	—	0000000000
16781	—	—	0	1	0000000000
16924	—	—	26	1	0000000000
17031	—	—	0	1	0000000000
16831	—	2	80	2	0123210000
16916	—	—	0	1	0000000000

The manic-depressive group comprised forty-three cases. An attempt was made in these cases to rule out a symptomatic mania or depression due to a syphilitic infection the cases being considered circular insanity with concomitant syphilis and grouped accordingly. Among the forty-three, twelve gave syphilitic curves, twenty-eight negative reactions and three suggestive paretic curves. Four cases gave positive Wassermann reactions of the serums with negative spinal

fluid reactions in three and a syphilis curve in one. Only one spinal fluid gave a positive Wassermann reaction. Twelve cases gave a pleocytosis above normal.

TABLE 6.—Epileptics

Case Number	Wassermann Test		Cells	Globulin	Colloidal Gold
	Blood	Spinal Fluid			
14354	—	—	0	—	0000000000
14862	—	—	40	4	1112333111
15051	—	—	0	—	0000000000
15184	—	—	0	—	0000000000
15281	—	—	0	—	0000000000
15381	—	—	3	—	0000000000
15382	—	—	0	—	0000000000
15381	—	—	0	3	0000000000
15393	—	—	0	—	0000000000
15398	—	—	0	—	0000000000
15468	—	—	20	2	0000000000
15505	—	—	10	2	2221100000
15516	—	—	6	1	0000000000
15536	±	—	5	1	0000000000
15698	—	?	6	1	0000000000
15756	—	—	10	1	1122110000
15759	—	—	0	1	0012211000
15766	—	—	5	—	1122110000
15805	—	—	0	—	0000000000
15820	—	—	0	—	0000000000
15824	—	—	3	—	0000000000
15840	—	—	0	—	0000000000
16099	—	—	0	—	0000000000
16206	—	—	0	—	0000000000
16231	—	—	0	1	0012100000
16285	—	—	0	—	0000000000
16308	—	—	0	2	0000000000
16351	—	—	8	1	0000000000
16362	—	—	0	—	0000000000
16366	—	—	0	—	0000000000
16475	—	—	20	4	0001211000
16476	—	—	0	—	0000000000
16515	—	—	2	—	0000000000
16502	—	—	5	—	1122100000
16660	4	—	5	1	0000000000
16685	—	—	0	2	0122100000
16727	—	—	5	2	0012100000
16855	—	—	5	—	0122100000
16971	—	—	10	4	1111233211
17013	—	—	0	3	0012210000

There were forty cases in the epileptic group, twelve giving syphilitic curves, twenty-seven negative reactions and one a suggestive incipient paretic curve. One case showed a positive Wassermann reaction of the serum with a negative gold curve. All spinal fluids gave negative Wassermann reactions. Six cases showed a cell count above normal.

The twenty-eight cases in the dementia praecox group formed one of the most interesting. Nine syphilitic curves were given, two in the hebephrenic and seven in the paranoid group. Eighteen cases gave no curves. Case 15760 was positive in all the reactions, being diagnosed a praecox with cerebral syphilis, alcoholic paranoia not excluded. Seven cases showed a cell count above normal. Cases 15815 and 16104 came to necropsy, the first demonstrating no evidence of syphilis, the second showing a very moderate endarteritis of the basal brain vessels.

TABLE 7.—DEMENTIA PRAECOX

Case Number	Wassermann Test		Cells	Globulin	Colloidal Gold
	Blood	Spinal Fluid			
15681	—	—	5	—	0000000000
16411	—	—	0	1	0012210000
16482	—	—	0	—	0000000000
16639	—	—	3	—	0000000000
16821	4	—	20	2	0011211000
16861	—	—	0	—	0000000000
16862	—	—	0	—	0000000000
15074	—	—	0	—	0000000000
15018	—	—	0	1	0000000000
16717	—	—	0	—	0000000000
15049	—	—	0	—	0000000000
15191	3	—	0	—	0000000000
15471	—	—	2	—	0000000000
15689	—	—	0	1	0000000000
15703	—	—	0	—	0000000000
15760	4	4	10	2	2223320000
15834	±	—	15	1	0012211000
15815	—	—	10	—	0000000000
16203	—	—	0	3	0122100000
16221	—	—	5	1	0122100000
16303	—	—	0	1	0122100000
16342	—	—	0	—	0000000000
16504	—	—	2	1	0000000000
16653	—	—	5	—	0000000000
16700	—	—	30	3	0122110000
16849	—	—	0	—	0000000000
16863	—	—	15	1	0122100000
16104	—	—	10	—	0112210000

TABLE 8.—INEBRIATES

Case Number	Wassermann Test		Cells	Globulin	Colloidal Gold
	Blood	Spinal Fluid			
15006	4	—	10	2	0000000000
15047	±	—	10	1	0000000000
15203	—	—	20	—	0000000000
15204	±	—	0	—	0000000000
15297	—	—	0	1	0000000000
15299	—	—	7	3	0011122000
15408	—	—	0	—	0000000000
15507	—	—	0	3	0000000000
15513	—	—	0	2	0000000000
15532	—	—	0	—	0000000000
15634	4	—	5	1	0000000000
15684	—	—	0	1	0000000000
15710	—	—	0	—	0000000000
16098	—	4	10	—	0011220000
16129	4	—	0	1	0000000000
13976	4	±	0	—	0000000000
16240	—	—	0	—	0000000000
16252	—	—	0	—	0000000000
16281	—	—	10	1	0122110000
16287	—	—	5	1	0000000000
16429	—	—	3	1	0012110000
16463	4	—	6	1	0000000000
16485	—	—	10	1	0012110000
16567	—	—	15	3	0012100000
16695	—	±	30	1	0112210000
16761	—	—	5	—	0012110000
16760	—	4	0	1	0122100000
16456	—	—	0	1	0011210000
16662	—	—	50	—	0121000000
15820	—	±	2	—	0012110000

Among the thirty inebriates, twelve gave syphilitic curves and eighteen showed no curves. Cases 16761 and 16760 were paranoics, Case 16695 an hallucinosis and Case 15820 a delirium tremens.

TABLE 9.—Drug Habitués

Case Number	Wassermann Test		Cells	Globulin	Colloidal Gold
	Blood	Spinal Fluid			
14821	—	?	3	2	1112200000
15098	4	—	10	2	0011122100
15283	—	—	5	1	0000000000
15287	±	—	6	1	0000000000
15321	±	—	5	—	0000000000
15416	4	—	10	2	0011122100
15981	—	—	3	1	1123100000
16043	—	—	0	1	0000000000
16080	±	—	0	—	0000000000
16182	±	—	0	1	0012210000
16201	—	—	3	2	0012110000
16371	—	—	5	1	0012210000
16693	—	4	10	1	0122100000
16925	—	—	0	2	0122110000

Among the fourteen drug cases, nine gave syphilitic curves, three being reinforced by positive Wassermann reactions. In Case 16693 the patient was a tabetic.

TABLE 10.—Miscellaneous Group

Case Number	Wassermann Test		Cell	Globulin	Colloidal Gold	
	Blood	Spinal Fluid				
15491	—	—	0	2	0000000000	Exhaustion psychosis
15655	—	—	2	—	0000000000	Exhaustion psychosis
16212	—	—	0	—	0000000000	Exhaustion psychosis
16262	—	—	8	—	0012210000	Exhaustion psychosis
16304	—	—	0	—	0000000000	Exhaustion psychosis
16496	—	—	3	—	0000000000	Exhaustion psychosis
16580	—	—	0	1	0000000000	Exhaustion psychosis
16755	—	—	400	1	0000000000	Exhaustion psychosis
16812	—	—	?	—	0000000000	Exhaustion psychosis
16880	—	—	0	—	0000000000	Exhaustion psychosis
16921	—	—	10	1	0123210000	Exhaustion psychosis
15021	—	—	15	2	0000000000	Huntington's chorea
15461	—	—	5	—	0000000000	Huntington's chorea
15638	—	—	8	—	0000000000	Huntington's chorea
15731	—	—	0	1	0000000000	Huntington's chorea
15812	—	—	0	—	0000000000	Huntington's chorea
16284	—	—	2	—	0000000000	Huntington's chorea
16353	—	—	2	—	0000000000	Huntington's chorea
15136	±	—	10	—	0000000000	Hysteria
15168	—	—	0	—	0000000000	Hysteria
16657	—	—	3	—	0121000000	Hysteria
15307	2	—	3	—	0000000000	Delirium (drugs)
15535	—	—	0	—	0000000000	Delirium (organic dementia)
15799	—	—	0	—	0012210000	Delirium (org. brain disease)
17016	—	—	0	—	0000000000	Paralysis agitans
15263	—	—	5	—	0000000000	Paralysis agitans
15268	±	—	8	2	1122220000	Psychopath
15807	—	—	220	4	1111221000	Senile (postmortem fluid)
16734	—	4	40	3	1122110000	Tabes; not insane
15166	—	—	15	1	1221110000	Brain tumor (sarcoma)
15052	—	—	0	—	0000000000	Ideational apraxia

In the miscellaneous group, in Case 16755, the specimen was a postmortem fluid which accounted for the marked pleocytosis. Case 15638 among the Huntington's chorea group was given a necropsy examination and revealed an old, rather moderate lumbar tabes with a very moderate endarteritis of the pial vessels. Case 15166 was examined at necropsy showing a sarcomatous tumor in the region of the thalami.

SUMMARY

The following results were obtained from the gold test on the fluid of the 498 cases: 103 gave paretic curves with positive Wassermann reactions of either serums or spinal fluids, or both; 10 gave suggestive curves of incipient paresis with negative Wassermann reactions of serums and spinal fluids; 53 gave syphilitic curves with positive Wassermann reactions of either serums or spinal fluids, or both; 118 gave syphilitic curves with negative Wassermann reactions of serums and spinal fluids; 209 gave negative gold reactions, 14 of whom showed positive Wassermann reactions of the serums and 3 positive Wassermann reactions of the spinal fluids; 5 gave atypical curves, several of these being treated cases.

CONCLUSIONS

1. The spinal fluid of cases of dementia paralytica causes a quite characteristic curve with the colloidal gold solution which is of such frequent occurrence as to be diagnostic. Seven of our cases were confirmed by necropsy.

2. The spinal fluid of taboparetics may normally give syphilitic curves or rather low paretic curves as evidenced by the reactions of a number of our paretics and as confirmed by necropsy.

3. Cerebrospinal syphilis gives a curve which may be considered diagnostic.

4. Syphilitic curves with negative Wassermann reactions of serums and spinal fluids may be obtained in cerebrospinal syphilis having been demonstrated pathologically in five of our cases, the reaction not necessarily being due to a dialyzable substance other than syphilitic.

5. The gold curve is of value in clearing up the etiology of old arteriosclerosis with negative Wassermann reactions; necropsies having demonstrated a syphilitic type of vascular lesion in cases giving syphilitic curves and a simple senile degeneration of the vessels in cases giving negative gold reactions.

6. It is of interest that five cases of Huntington's chorea gave negative gold reactions, one of which, however, demonstrated pathologically an inactive moderate tabetic involvement of the lumbar regions.

7. The syphilitic curve may be of value in clearing up the etiology of mental deficiencies after an active syphilitic process has ceased and antibodies have disappeared from the body fluids.

8. The globulin reaction is rather uniformly strongly positive in paretics and a fair proportion of syphilitics, but there appears to be no definite relationship between the curve and the strength of the reaction.

THE RÔLE OF THE PITUITARY GLAND IN EPILEPSY

BEVERLEY R. TUCKER, M.D.
Professor of Neurology and Psychiatry, Medical College of Virginia
RICHMOND, VA.

The problem of epilepsy may be best approached by considering all convulsions which are accompanied by unconsciousness, whether periodic or otherwise, as symptoms of some underlying pathologic state or disease. By doing this the convulsion becomes a symptom. The question then arises, which I believe should be answered in the negative, whether any so-called epileptic state should, of itself, be considered a disease.

ETIOLOGIC FACTORS

Thus, among the underlying causes of convulsions are uremia, eclampsia and other toxicoses; several varieties of trauma, as birth trauma and that from blows on the head; certain intracranial irritations, as brain tumors and cerebral hemorrhages; certain infections, as syphilis and varieties of meningitis; certain conditions of cerebral maldevelopment accompanied by a degree of brain cell deterioration; *and certain conditions of the pituitary gland causing a change in its secretion.*

I believe, therefore, that convulsions, whether periodical and termed epilepsy, or not, are due to definite pathologic cerebral tissue changes which may be congenital or induced, and hence, that epilepsy is an organic and not a functional condition. In the toxic and pituitary cases there may exist previous malformation and instability of the cortical cells, or, on the other hand, it is perfectly conceivable that the toxic substance or the changed pituitary secretion may produce their own cortical cell deterioration. I published a paper on the relation of the pituitary gland to some cases of epilepsy, and in 1914[1] and again in 1916,[2] a paper on the subject of hypopituitarism in its relation to epilepsy. These papers were the result of a personal suggestion of Dr. Harvey Cushing and also of the perusal of his most excellent book.[3]

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* Read before the Section on Nervous and Mental Diseases at the Seventieth Annual Session of the American Medical Association, Atlantic City, N. J., June 11, 1919.

1. Tucker, B. R.: South. M. J. **7**:608 (Aug.) 1914.
2. Tucker, B. R.: Virginia M. Semi-Month. **31**:1 (April 7) 1916.
3. Cushing, Harvey: The Pituitary Body and Its Disorders, Philadelphia, W. B. Saunders Company.

Dr. Daniel D. Talley has roentgenographed most of my cases and in nearly all instances the roentgenographic findings have confirmed the clinical diagnosis of either the permanent or the transitional stage of hypopituitarism. Dr. Johnston of Pittsburgh, I understand, was one of the earliest roentgenographers in noting pituitary changes in certain cases of epilepsy. In a paper read[4] before this section in 1918 I described transitory pituitary changes, causing psychoses occurring during adolescence. Some of these transitory changes appeared also to be the cause of convulsive states. Cushing believes that the secretion of the posterior lobe of the pituitary joins the cerebrospinal fluid and thus bathes the cerebral cortex with a substance which is necessary to the functional stability of the cortical cells. When this secretion is diminished or absent the cells may be said to deteriorate. Whether this deterioration is due to the lack of whatever the pituitary secretion may give them, or whether it takes place by the lack of this substance allowing toxic substances to exert a deleterious influence, I am not sure. At any rate it appears that the administration of pituitary gland extract tends to alleviate symptoms caused by undersecretion of the pituitary gland.

TWO TYPES OF CASES

There are two forms of hypopituitarism here described: one chronic or congenital, and the other transitional. In *chronic or congenital types,* the patients have, among other indications, increased fat, lack of body hair, feminine distribution of pubic hair in the male, scanty menstruation in the female, diminished perspiration, increased sugar tolerance, small genitalia, and frequently bradycardia and lowered blood pressure. In the *transitional type* the patient may show evidence of normal pituitary secretion, or hypersecretion in the past, which during adolescence becomes lessened. This is at times traceable to some illness or trauma. In these cases the patient begins to take on flesh, has an increased desire for sweets, become less energetic, eats voraciously, perspires less and may have slow pulse rate and lowered blood pressure. In either type occasional or periodic convulsions may occur, which usually make their appearance during adolescence. Convulsions may also occur in cases of tumor of the pituitary body, as pointed out by Cushing, but the discussion of tumor cases is not included in this paper.

PATHOLOGIC CHANGES OBSERVED

Roentgenographic examinations in the chronic or congenital type of hypopituitarism have shown small fossae with large clubbed pos-

4. Tucker, B. R.: Pituitary Disturbance in Its Relation to the Psychoses of Adolescence, J. A. M. A. **71**:330 (Aug. 3) 1918.

terior processes and frequently elongated anterior processes tending to bridge the fossa. Many of these cases have shown irregularity in the contour of the posterior part of the sella.

In the transitory type roentgenographic examinations have revealed either normal-sized or enlarged fossae, according to whether the clinical symptoms have pointed to normal or hypersecretion in the past. The posterior processes have been enlarged and clubbed. The anterior process may be enlarged and, at times, bridging between the processes has been observed. Roughening of the posterior contour of the sella is usually found.

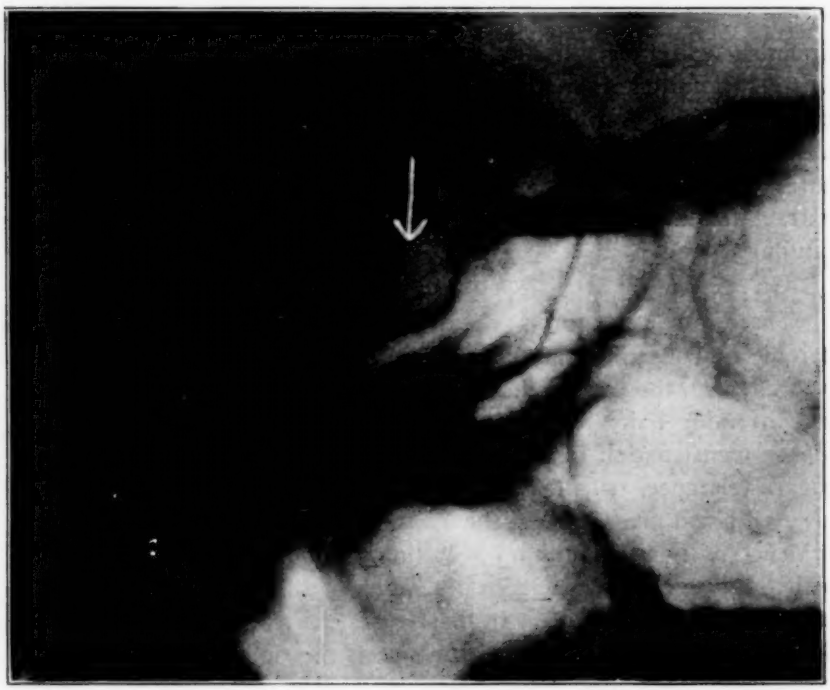

Fig. 1.—Large fossa, elongated processes slightly roughened; hyperpituitarism.

The roentgenographic difference, therefore, between the two types lies chiefly in the size of the fossae, that of the chronic type being decreased and that of the transitional type being normal or enlarged in general contour even if encroached on by bony growth.

AUTHOR'S OBSERVATIONS

The present investigation is based only on the study of my last 200 cases of epilepsy, for the reason that I do not feel that previous to these cases I had knowledge or experience enough in the pituitary

type of convulsions to examine them sufficiently or judge of them accurately.

Of the 200 cases, sixty-three, or 31.5 per cent., revealed some evidence of pituitary disturbance. Of these sixty-three cases, thirty-five were discarded for the reason that they had in addition to clinical and roentgenographic signs of dispituitarism, evidence of syphilis, marked nephritis, active toxemia from focal infections, hydrocephalus,

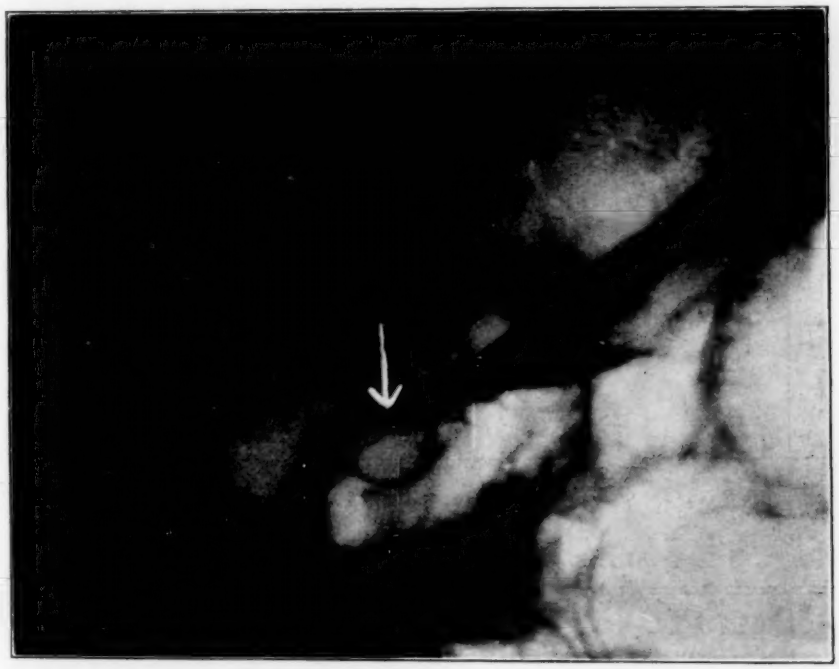

Fig. 2.—Small fossa, anterior and posterior processes approximated; hypopituitarism.

organic brain disease or injury, or because the evidence of pituitary disturbance was so slight that it was negligible. However, in most of these, pituitary feeding was beneficial. We thus have left *twenty-eight pure pituitary cases, or 14 per cent.* Of these twenty-eight cases, seventeen were of the chronic hypopituitary type, and eleven of the transitional hypopituitary type.

TREATMENT

In the treatment of these cases if bromid was being taken small doses were continued, and in some of the severe cases small doses were given, especially at first. The effort, however, was made to get the patient off of bromid.

TABLE 1.—Chronic Hypopituitary Type *

Case	Age of Onset of Attack	Type of Attack	Average Frequency of Grand Mal	History of Injury or Disease	Preparation of Gland Used	Result of Feeding	Remarks
1	11	Grand	1 a month	Injury to head when 7 years old	Whole gland	Two in 18 months	Marked improvement
2	14	Grand	1 every month	None	Whole gland	None in 3 years	Cured
3	18	Grand	1 every 6 weeks	Head injury as child	Whole gland	None for 14 months	Attacks ceased
4	18	Grand	1 every 2 months	None	Anterior lobe gland	1 every 2 months	Not improved
5	11	Grand	1 a month	None	Whole gland	Three in 18 months	Marked improvement
6	12	Grand	2 to 3 a week	None	Whole gland	No attacks over 3 years	Cured
7	10	Petit	No grand, petit daily	Injury to head as child	Whole gland	No attacks over 3 years	Cured
8	13	Petit	No grand, petit many a day	None	Whole gland	None for over 3 years	Cured
9	12	Grand	3 a year	None	Whole gland	None for over a year	Prospects of a cure
10	13	Grand and petit	1 to 2 a week	Head injury as a child	Whole gland	One a month	Improvement
11	9	Grand	3 or 4 a year	Head injury 5 years old	Anterior gland	None for 2 years	Prospects of cure
12	30	Grand	1 every 6 weeks	None	Whole gland	One in 2 years	Prospects of cure
13	17	Grand	3 a year	Malaria	Whole gland	Same as before	Took medicine irregularly
14	15	Grand	1 a week	None	Whole gland	One in 2 months	Marked improvement
15	13	Grand	1 every 6 weeks	Rheumatism	Whole gland	One every 3	Improvement
16	11	Grand	1 a month	None	Whole gland	None for over 2 years	Apparent cure
17	8	Grand	1 every month or 2	None	Whole gland	None for 6 months	Marked improvement

* All of these patients had definite evidence of clinical hypopituitarism and roentgenographic signs of the chronic type of hypopituitarism. The general health and mental condition of the patients improved while taking pituitary extract.

TABLE 2.—Transitional Hypopituitary Type *

Case	Age of Onset of Attack	Type of Attack	Average Frequency of Grand Mal	History of Injury or Disease	Preparation of Gland Used	Result of Feeding	Remarks
1	18	Grand	1 every 2 months	None	Anterior lobe gland	One attack 18 months	Marked improvement
2	25	Grand and petit	1 every 2 months	None	Whole gland	Recent	Too recent to judge
3	13	Grand	1 every 3 weeks	Injury to head as child	Whole gland	Two in 9 months	Marked improvement
4	24	Grand	1 or 2 a month	None	Whole gland	Same as before	No improvement
5	20	Grand	1 every 6 months	None	Anterior lobe gland	None for 2 years	Prospects of cure
6	12	Grand and petit	1 a week	None	Whole gland	None for 18 months	Prospects of cure
7	17	Grand	1 every 2 or 3 months	Injury to head as child	Whole gland	One series of several attacks	Improvement
8	17	Grand	2 to 4 a week	None	Whole gland	No attacks for 8 mo.	Prospects of cure
9	22	Grand	1 a month	None	Whole gland	One every 2 months	Improvement
10	22	Grand and petit	3 a week	Injury to head few years before	Whole gland	None for 18 months	Prospects of cure, petit attacks rare
11	13	Grand	1 a week	None	Anterior lobe gland	One every 2 months	Marked improvement

* All of these patients had definite evidence of clinical hypopituitarism and roentgenographic pictures revealed the transitional type of that condition. It was noted that the general health and the mental condition of the patients greatly improved in all cases.

CONCLUSION

I believe that there is a definite relation between the undersecretion of the pituitary gland and a group of periodic convulsive attacks usually termed epilepsy; that this group is divided into a chronic hypopituitary type and a transitional hypopituitary type by both clinical and roentgenographic evidence; and that pituitary gland feeding has a markedly beneficial effect not infrequently leading to cure.

Fig. 3.—Moderate-sized fossa, enlarged roughened processes; transitional case.

DISCUSSION

DR. WALTER TIMME, New York: Dr. Tucker's report on what he has done is perhaps really too modest. The number of phases we see of this type that can be helped as far as the epilepsy is concerned, is quite large. The cures are cures as effective and quite as prompt as he has suggested. It remains to determine which are the proper cases for such therapy. You cannot from the appearance of the sella turcica on the roentgenogram determine if the person has epilepsy. Every hypopituitary case in which the patient has epilepsy shows sella changes, but every case with sella changes does not necessarily mean that the individual has epilepsy. You must remember also that the formation of the sella turcica does not necessarily go hand in hand with equivalent changes in the hypophysis. If the sella is large you can have all kinds of changes in the hypophysis without any effect on the sella. Sir Victor Horsley made an interesting experiment in this direction. He found the cerebral cortex in dogs was

more sensitive to electric currents after removal of the hypophysis than before. That led him to suspect that the irritability of the cortical cells was in a measure due to the lack of secretions of the hypophysis. As a matter of fact, these hypopituitary individuals, even though apparently sluggish, have also increased cortical irritability. They improve by feeding on pituitary extract. In Plattsburg we saw a man who had epileptic convulsions and the case was recognized as one of dyspituitarism of the Froelich dystrophia type. He was put on pituitary treatment and thereafter had only one convulsion in six months, previously having had convulsions daily, or three or four times a week. I have two slides which, with the permission of the chairman, I will show, demonstrating this phase of the situation. They are both cases of dyspituitarism, but show absolutely different physical signs. The acromegalic had epilepsy, the Froehlich dystrophia type had not. The acromagelic was cured by administration of pituitary substance.

Dr. H. H. Hoppe, Cincinnati: I have been struck with the relation between certain types of dyspituitarism and the appearance of epilepsy, especially the type which shows changes of a sexual character in young individuals. I had one case in particular, a boy who had feminine characteristics and large masses of fatty distribution. He has been under treatment four or five years with extract of pituitary gland, and there has been no change in the number of attacks or in the character of the epileptic attacks as a result of the administration of pituitary gland. Perhaps I made the mistake of limiting him to the anterior lobe. The anterior lobe stands in close relation with the development of sexual characteristics and if you have disease of the anterior lobe you will have heterogeneous sexual characteristics. This boy showed typical feminine characteristics, and the change that has occurred in him has been the development of characteristics of a masculine nature. He has grown to be a strong, slender, handsome man, all the feminine characteristics have disappeared except the masses of fat, but the epileptic attacks have not been changed by the administration of the anterior portion of the gland. I consider it was the dyspituitarism which gave rise to this case and to the abnormal sexual development. I have another case in which there has been no result from treatment, perhaps on account of the same limitation to the anterior lobe.

Dr. E. B. Angell, Rochester, N. Y.: I wish to corroborate the statement made by Dr. Tucker and assure Dr. Hoppe that if he would use the extract of the whole gland he would get results. I believe it is the cases that occur during puberty that receive the most benefit from this therapy. I have been following the same process in a mild form of dementia praecox and have obtained similar results. I have had several remarkable results with extract of the whole gland in several cases of dementia praecox with the very type that presents some of these symptoms at puberty.

Dr. George A. Moleen, Denver: I believe we are wise to believe that epilepsy and dementia praecox are produced by the same conditions. I think we all realize that when we find a disproportional secretion of the endocrine glands we are entitled to consider this as due to disequilibration in the same fashion as the hormones are considered. I do not see why we cannot associate a form of epilepsy to the hormonic inequilibration any more than we can associate epileptic seizures with alterations in the sella turcica. We find many patients with pituitary evidences predominating, but more are without epilepsy than with. That is particularly true in the normal type of pre-

adolescent deficiency. We are able to interpret them as the result of hormonic disequilibration rather than as disease of one of the structures, namely, the pituitary itself.

Dr. Albert E. Sterne, Indianapolis: Some years ago I used the anterior lobe of the pituitary in a large number of cases of epilepsy and had no results whatever. I came to the conclusion that it was absolutely ineffective and have seen no reason to change that opinion since. I have had no beneficial results whatever in the administration of the anterior lobe of the pituitary. Dr. Timme said yesterday that the anterior lobe extract was rather dangerous. My experience has been quite the contrary. He stated that in using the whole pituitary he used fresh substance. I would like to know where he obtains the fresh gland. We have had difficulty in getting the substance of any of the gland. The general results with feeding of the whole substance formerly was appreciably better than with the anterior or posterior lobes alone, but I cannot say that our results in several hundred epileptics have been anything like as pronounced as the report of the essayist, Dr. Timme and others. Either the substance they used is different or else they have had better success in the administration. There is another point I would like to mention, in reference to the roentgenograms of the sella turcica that were shown by Dr. Timme. They were all taken from the lateral point of view. Recently we have been taking our roentgenograms from the top directly so the rays enter through the infundibular opening. That gives us the dimensions from side to side. We have found that the sella turcica thus shows up better. We sometimes think we are dealing with an imprisoned hypophysis when we are merely judging from a side view.

Dr. Walter Timme, New York: With the permission of the chairman I will answer the question regarding the extract of the pituitary substance. I usually have a man go to the abattoir and get the whole substance. He dries it and puts it in capsules. Occasionally we use the steer, but usually the hog. The Armour preparation is fairly fresh, and if taken within a reasonable length of time and kept cold and dry it will answer. Regarding the roentgenograms I showed, they were taken almost directly laterally and always stereoscopically and one directly down, but only one picture was shown on the screen which gave the general structural outline to the best advantage.

Dr. Irving J. Sands, Brooklyn: In regard to the roentgenographic changes in the sella turcica I have tried to check them up at necropsy in fifty cases and I have not found any relation between the pituitary gland and the size or shape of the sella. We have had roentgenograms made of a few of these patients antemortem, and there was no relation between the changes in the pituitary and the sella turcica. I believe that with a few exceptions, such as acromegaly, the sella has no more to do with the condition or function of the pituitary gland than the shape of the nose has to do with one's respiration. I believe that the fibrous condition of the capsule has more to do with the functional possibilities of the pituitary gland because we have found many changes in the capsule where there were none in the sella itself.

Dr. Beverley R. Tucker, Richmond, Va.: I think the shape of the nose has a good deal to do with the respiration. As far as the glandular substance is concerned, there are few patients to whom I give the anterior lobe, particularly if the blood pressure happens to be high. I give the whole gland capsule. There are three elements that must be present in these cases. If you want to have results you have to have the age of adolescence, the clinical type

and the roentgenographic findings. It is very hard to get a necropsy on an epileptic, but I would not take the finding on a case that did not have convulsion as a criterion at all. There are two distinct types of chronic hypopituitary cases. It is usually after puberty that these convulsions begin. Some give a history of having been normal until receiving a blow on the head or suffering from an acute infection after which the convulsions began. It seems to stir up something in the gland.

I remember ten or twelve years ago a neurologist made the statement before our Section that there was no such disease as neurasthenia. We were shocked then, but I think we have all come around to his opinion today. We may as well assume now there is no such disease as epilepsy which is always due to some distinct pathologic condition, and we will thereby separate off one group after another and treat the convulsions as a symptom, and cure the condition incidentally. Looking over these 200 cases, I found that ten were syphilitic; they had positive Wassermann reactions. These people should not be considered epileptics; they should be considered syphilitics. If we take that view we will approach the passing of the old hopeless epilepsy.

THE RESEMBLANCE OF THE SENSORY SYMPTOMS OF POST-DIPHTHERITIC ATAXIA TO THOSE SEEN IN THE CORD CHANGES OF SEVERE ANEMIA*

GEORGE WILSON, M.D.
Instructor of Neurology, University of Pennsylvania; Assistant Physician to the Philadelphia General Hospital

PHILADELPHIA

Combined sclerosis or postero-lateral sclerosis of the spinal cord occurring in certain conditions, more especially pernicious or grave secondary anemia, has been recognized for many years; it was not, however, until 1913 that the characteristic loss of sensation was pointed out by Dejerine.[1] That eminent French neurologist showed that the affection of the posterior columns begins medially and spreads outward; as a result the fibers which are first involved are the long conduction fibers which ascend uncrossed in the columns of Goll and Burdach. This gives a loss of certain forms of deep sensibility, that is, of the sense of position and the sense of vibration; all other forms of sensation remain intact until the disease has produced widespread changes in the cord, changes which amount practically to a transverse myelitis. Patients with the disease almost invariably have subjective sensory disturbances in the form of paresthesias of the feet, legs and hands.

Diphtheria may involve the nervous system in a number of ways, thus the only sign that nervous structures have been attacked may be paralysis of the soft palate or of accommodation. The disease often produces serious disturbances of motion and coordination in the extremities. There is often a diffuse weakness or paralysis of the lower or upper extremities or of all four extremities. Another manner in which diphtheria may involve the nervous system is in the production of an acute ataxia which Dejerine[2] has described as a peripheral neurotabes.

From a pathologic point of view there is widespread involvement of the nervous system in diphtheria. Oppenheim states that "the diph-

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* From the Department of Neurology, University of Pennsylvania.

* Read in the Section on Nervous and Mental Diseases of the American Medical Association at the Seventieth Annual Session, held at Atlantic City, N. J., June, 1919.

1. Dejerine: Société de Biologie **75**:554, 1913.

2. Dejerine: Arch. d. Physiol., 1887.

theritic poison acts upon the whole nervous system, producing the most marked symptoms now at this site, now at that, but most often in the peripheral nerves, and that it may also have a toxic effect upon certain areas without producing structural changes in them." He also states that the neuritic processes constitute the essential basis of diphtheritic paralysis. That this is true of post-diphtheritic ataxia I seriously doubt.

LITERATURE

A number of investigators have examined the nervous system in diphtheria. Some have studied material from persons who died after an acute illness, some from patients who died weeks or months after the attack of diphtheria and others have approached the subject from an experimental angle.

Preisz[3] found a marked degeneration of the peripheral nerves. In the cord he found numerous hemorrhages, chiefly in the gray matter. The white substance was normal, except in one case which presented an advanced grade of degeneration in the posterior columns. Bikeles[4] in one case of post-diphtheritic paralysis and ataxia found degeneration of the posterior column and to a lesser degree of the posterior roots. Arnheim's[5] cases showed extensive degeneration of all nerves examined and capillary hemorrhages in the cord. Thomas[6] found degeneration of the peripheral nerves, and in the cases where the cord was examined and in which a definite pathology was present, the posterior columns were always most seriously affected.

Henschen[7] reported a case of acute disseminated sclerosis following diphtheria. His patient died three months after the attack. The microscopic study of the nervous system showed, in addition to a marked polyneuritis, a great number of disseminated areas of sclerosis in the cord, most marked in the posterior columns and associated with intense perivascular infiltration. Oppenheim[8] and Redlich[9] have had similar cases. In experimental work, Babes[10] found general edema and softening in the cord most marked in the posterior and lateral columns. Martin[11] found the cord normal in his experiments.

There have been a number of clinical reports which show that

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3. Preisz: Deutsch. Ztschr. f. Nervenh. **6**:95, 1895.
4. Bikeles: Wien. **2**:26, 1894.
5. Arnheim: Arch. f. Kinderh. **13**:461, 1891.
6. Thomas: Reports of the Boston City Hospital, 1898.
7. Henschen: Fortschritte der Medicin, p. 529, 1896.
8. Oppenheim: Textbook of Nervous Diseases, Chicago, Chicago Medical Book Co. **1**: 321.
9. Redlich: Die Deutsche Klinic, p. 561.
10. Babes: Virchows Arch. f. path. Anat. **119**:168, 1890.
11. Martin: **1**:26, 1892.

various parts of the central nervous system may be involved during an attack of diphtheria. Rolleston[12] investigated the plantar reflex in 870 cases of diphtheria. In 172 of these the extensor response was obtained at some period of the illness showing that the pyramidal tracts were involved either through a toxic action or by edema and capillary hemorrhage. The mortality was higher in the class of patients who developed the Babinski reflex and the incidence of paralysis was greater.

Taylor[13] reported a case of Friedreich's ataxia which developed after a post-diphtheritic paralysis. In analyzing the symptomatology of that case it seems to me more likely that his patient really never recovered from the diphtheritic involvement of the central nervous system.

Tinel and Siredey[14] reported the eighth case in literature of chronic bulbar paralysis following diphtheria. They explained the occurrence of the bulbar symptoms in their case by assuming that the toxins traveled along the nerves and ultimately produced sclerosis of certain nuclei of the cranial nerves.

AUTHOR'S OBSERVATIONS

The cases which I desire to record are of interest from the type of sensory loss which they show, the loss of sensation being exactly similar to that seen in the combined sclerosis of pernicious or severe secondary anemia. The subjective symptoms which were complained of in these cases were of the same character that is so common in anemia.

REPORT OF CASES

CASE 1.—*A man, aged 22, had diphtheria two months before the onset of symptoms which were paresthesia in hands and feet, fatigue on exertion and difficulty in walking. Examination revealed a Romberg sign; loss of all deep reflexes; loss of the sense of position and vibration in feet and legs; marked impairment in recognizing the points of a compass; all other forms of sensation were intact.*

History.—The patient, aged 22, a student in the University of Pennsylvania, came to the Students' Dispensary in the last week of February, 1917. During Christmas week of 1916, he had diphtheria, and was given three injections of antitoxin during the course of the illness which confined him to his room for ten days. He was apparently well until a few days before he came to the dispensary, two months after the attack of diphtheria. At that time he had numbness in the feet and hands. The numbness became gradually worse and

12. Rolleston: Rev. Neurol. and Psych., p. 404, 1910.

13. Taylor: Proc. Roy. M. & Chir. Soc., Sec. of Neurol. **7**: 1913-1914.

14. Tinel and Siredey: Bull. et mém. Soc. méd. d. hôp. de Par., Nov. 22, 1906, p. 1126.

was associated with other paresthetic phenomena. The legs became weak and walking caused fatigue. He did not have either difficulty in reading or diplopia.

Examination.—The gait was ataxic and a Romberg sign was present. The biceps, triceps, patellar and Achilles reflexes were absent. Plantar stimulation produced flexion of the toes on both sides. The extensors of the toes and feet were slightly weak. Sensation was normal for light touch, pain (pin prick and the pain of deep pressure), heat, cold and deep pressure throughout the body. The sense of position was seriously disturbed in the toes and ankles; the vibratory sense was affected below the middle of the legs; there was impairment of the compass test over the feet and lower part of legs. There was slight ataxia and clumsiness in the upper extremity, without any disturbance of sensation or motion. The cranial nerves were normal. The nerve trunks were not tender on palpation. This man recovered entirely and when last heard of was with the American Expeditionary Force.

CASE 2.—*A soldier, aged 24, contracted diphtheria in France early in January, 1918; shortly after his throat cleared up, he had difficulty in reading; regurgitation of fluid from the nose; six weeks later paresthesias in the feet, soon involving the legs and hands; marked ataxia in all extremities; Romberg sign present; all deep reflexes lost; sense of position, vibratory sense and the compass test markedly disturbed in the feet, legs and hands; all other forms of sensation intact.*

History.—This patient was a soldier belonging to the 163d Infantry and stationed near Blois, France. In the first week of January, 1918, he had a severe attack of diphtheria for which he was treated at the camp infirmary for two weeks. Coincident with his discharge from the hospital he had dimness of vision and regurgitation of liquids through the nose. These conditions persisted three weeks and then gradually wore away. On February 20, he had for the first time paresthesias in the feet; the paresthesia became worse and soon involved the legs and hands. In a short time he had difficulty in walking and in using the hands for the finer movements, such as dressing and writing. He had no pain. He was sent to Blois on March 28.

Examination.—He was very ataxic in the finger to nose test and in walking and presented a marked Romberg sign. The biceps, triceps, patellar and Achilles reflexes were lost. Plantar stimulation produced flexion of the toes. There was no motor involvement with the exception of slight weakness in the flexors of the fingers and wrists. The cranial nerves and the pupillary reflexes were normal. Sensation was normal for light touch, pain (pin prick and deep pressure), heat, cold and deep pressure throughout the body. The sense of position was seriously impaired in the toes, ankles, fingers and wrists; the vibratory sense and the compass test were impaired over the feet, legs and in the fingers and hands. The nerve trunks were not tender on pressure. This patient was not followed up.

CASE 3.—*A woman, aged 37, had diphtheria in November, 1917; at Christmas, paresthesias in feet which in time involved legs and hands; difficulty in walking and in performing fine movements with hands; gait and station markedly ataxic; sense of position and vibration impaired in toes and feet; touch sense very slightly impaired over dorsum of feet; all other forms of sensation normal.*

History.—This patient was referred to Dr. Spiller by Dr. Guthrie of Sayre, Pa., and she was admitted to the University of Pennsylvania Hospital, Feb. 18, 1918. I am indebted to Dr. Spiller for the privilege of reporting this case and the following notes are taken from the hospital record. In November, 1917, she had diphtheria and was ill for two weeks. She was apparently well

from the first day out of bed until Christmas, when paresthesias were noted in the feet. In the course of three weeks the paresthetic sensations ascended as high as the knees. Two weeks before admission to the hospital, she began to have difficulty in walking and in using the hands for sewing and writing. She had never had pain in the legs or arms.

Examination.—The gait was very ataxic and a marked Romberg sign was present. There was no ataxia in the finger to nose test. The biceps, triceps, patellar and Achilles reflexes were absent. Plantar stimulation produced flexion of the toes on both sides. The arms and hands were moved about freely and no muscular weakness was present The lower extremities were moved well but there was slight weakness in certain movements, namely, extension of the toes and feet and extending the legs on the thighs. Sensation was normal for pain, heat and cold throughout the body. Touch was slightly impaired over the outer side of the dorsum of both feet. The sense of position was lost in the toes of both feet, but was normal at the ankles. The sense of vibration was lost over the feet, and was diminished over the lower part of the legs. The nerve trunks were not tender on deep pressure. The cranial nerves, the reflexes of the pupils, the blood and the cerebrospinal fluid were normal. The urine showed a slight amount of sugar and on one occasion a positive test for acetone. This patient remained in the hospital only four days.

PRACTICAL CONSIDERATIONS

From an analysis of the sensory symptoms in these cases it will be noticed that all three cases had paresthesias in the hands and feet, and all showed a loss or marked impairment of the sense of position and of vibration, and that in two of the cases with absolute preservation of touch sense there was impairment of the ability to recognize the two points of a compass.

Cassirer[15] has reported a case of post-diphtheritic polyneuritis with loss of osseous sense and the sense of position.

Where is the pathology of a process which can pick out and impair the conduction fibers for the sense of position and the osseous sense, and also render the recognition of the two points of a compass impossible or nearly so?

Head[16] has given us the following information regarding the relation of the various forms of deep sensibility (with the exception of the sense of vibration) to one another in the peripheral nerves and in the spinal cord and also their relation to the compass test. The power of discriminating two points of a compass depends on the integrity of touch sense. If this is impaired it is clear that the compass test is of little use. In cord lesions studied by Head, especially cases of Brown-Séquard paralysis, the power of discriminating the two points of a compass was impaired or lost on the side of the motor weakness and was associated with loss or impairment of the sense of

15 Cassirer: Die Deutsche Klinic, p. 804.

16. Head: Brain **26**:537, 1906.

position and passive movement. In the peripheral nervous system there is an intimate relation between sensibility to deep pressure and the pain produced by it, and the ability to recognize passive movement and position. All three are present or absent after lesions of the peripheral nerves and all three depend on the integrity of those fibers which run with the muscular nerves. In the spinal cord the fibers conducting the sense of position and passive movement are separated from those conducting deep pressure and the pain of deep pressure and ascend with the vibratory or osseous sense in the posterior columns.

LOCATION OF THE LESIONS

It seems reasonable to me to place the lesions which account for the sensory loss in the cases here described in the posterior columns of the cord and not in the peripheral nerves. So far as I know, in no other part of the nervous system are the fibers which conduct the osseous sense, the sense of position and the ability to recognize the points of a compass grouped together. In all of these cases the motor loss was insignificant and the ataxia was the predominating symptom. If disease of the peripheral nerves were responsible for such a loss of sensation one would expect to find in addition, a loss of deep pressure sense and a marked impairment of motor power.

Pathologic reports show that the posterior columns of the cord are usually most seriously damaged when the cord is involved during the attack of diphtheria. The cases of Bikeles, Henschen, Oppenheim and others show the same to be true in cases that recover from the acute illness only to succumb to the subsequent disease of the nervous system. In the consideration of the changes which occur in the central nervous system during an attack of diphtheria it is interesting to note that perhaps a number of cases of disseminated sclerosis may originate from this infectious disease.

The nature of the pathologic process which I have postulated as the cause of the sensory loss related in my cases is not necessarily destruction of tissue, but a toxic action on the posterior columns, and very likely in some instances due to edema and capillary hemorrhages which usually clear up.

THE DIAGNOSIS OF "WAR PSYCHOSES"

GEORGE E. McPHERSON, M.D. (MEDFIELD, MASS.)
Major, M. C., U. S. Army

AND

LESLIE B. HOHMAN, A.B., M.D. (BALTIMORE)
Lieutenant, M. C., U. S. Army

Shortly after the beginning of the war it was rumored that a number of anomalous psychoses were being observed among the soldiers; that is, patients in whom all the symptomatology previously would have led the psychiatrist to give a gloomy prognosis, but who recovered spontaneously without apparent residual. This group was understood to contain only psychogenetically-determined psychoses, and did not include any cases which might be regarded as organic. Until the fall of 1918 no opportunity was offered us to see anything of this war result with the exception of a few sporadic cases.

Two of these, however, were calculated to increase one's interest in the type of clinical material to be seen. The first case was that of a psychosis in a sergeant who had led an unusually sheltered life, with no adequate notion of sex adaptation. He had had no opportunity frankly to face problems because his entire family life had been dominated by the Christian science activities of his mother. The psychotic episode followed pneumonia. After an initial period of delirium, the disorientation disappeared completely, leaving the patient with ideas that electricity was being placed in his bed; that he had been made into a monkey; that he had been contaminated with "filth," and that "purity first" would save the world. He complained of a sense of body alteration. Nocturnal enuresis persisted for some time, and was regarded by the patient as a fluid withdrawn from him by the influence of "some woman." All his utterances gave evidence of profound, instinctive disorientation in the face of clear, general orientation. Although the soldier had not seen overseas service, the case suggested what might be expected if men were suddenly transplanted from a sheltered, protected life, with its relatively simple environment, to the hurly-burly of active service, with all its difficulties of adaptation. After his recovery he gave an account of the horror with which he had viewed the facts and manifestations of sexual life as told in the barracks.

A second patient — an officer who had been discharged with a diagnosis of paranoia — when first seen presented an elaborate system of persecutory delusions with retrospective falsifications. The patient had a long history of difficulties and to each he had reacted with

gastric hypochondriasis. After a period of intense homesickness overseas, he was notified that he was to be sent to the front. The fear of active service, although existing some time, suddenly became acute. His inability to face the situation frankly resulted in his acute psychotic episode. He justified his fear by regarding himself as persecuted. Interestingly enough, the gastric complaints disappeared completely throughout the period of his psychosis, only to reappear promptly when recovery from his paranoid state had taken place. Nothing in the symptomatology gave any inkling as to the outcome except the especially trying circumstances under which it had arisen. This case again gave evidence that anomalous psychotic episodes were to be expected when difficulties were thrust overwhelmingly on an individual barely able to handle ordinary problems in an environment to which he was reasonably well adapted and accustomed.

Another observation was recorded while treating psychoneurotics at U. S. General Hospital No. 30 during the summer and fall of 1918, where opportunity was offered to study patients who had developed psychoneuroses in this country as well as those who had developed them overseas. The cases could be separated roughly into two groups: (*a*) those arising in this country which were akin to similar states seen in civil practice, and (*b*) those which were the result of the unusual stress of active warfare. The majority of the former group showed insidious onsets and exhibited fundamental adaptative difficulties (inferiority feelings, masturbation worries, undue attachment to parents, etc.) and their symptoms antedated the war. The second group, although including soldiers constitutionally inferior, appear to be men much better disciplined to living. Probably this contrasting condition was brought about by the psychiatric weeding-out process as practiced in the camps. The fact that the overseas cases arose largely in response to the one dominating desire—to get out of the war —explains, to our minds, the relative ease with which they were cured, i. e., removal to hospital solved their difficulties. On the other hand, it was manifestly impossible to accomplish the same results for the domestic group of patients. We had, then, in the minor psychoses a lead to what we might expect in the major.

It was, therefore, with great interest that we welcomed the opportunity to study cases at a final clearing station — as it were — in a general hospital which was devoted to the major psychoses. We began our study of the material at U. S. General Hospital No. 34, in December, 1918. Many of the patients had been in the hospital for several months awaiting discharge. They had, apparently, completely recovered and each succeeding week brought a large number of additional recoveries. The majority of these cases had come to us with a

diagnosis of dementia praecox, although some of the diagnoses had been modified at the more recent hospitals to "Psychosis, Undiagnosed." As critically as the incomplete case records would allow, it seemed profitable to review this group of cases to discover, if possible, by what signs a more adequate diagnosis could have been made, or what the disease picture showed which could have given the key to the correct prognosis in the cases of so-called "praecox." We were prepared to take issue with the former classification which insisted on crowding all cases of the great group of the psychogenetically-determined disorders into the one of the two great pigeon-holes, manic-depressive psychosis or dementia praecox. Our study of these cases has strengthened that revolt against any classification which fails to take into account the great group of psychoses that cannot be correctly labeled either manic-depressive insanity or dementia praecox. We have no quarrel with words, but we do feel that a large part of the inability of the psychiatrist to sum up the case in terms of observed facts has been due to the feeling that it must be fitted definitely into one group or the other. If we substitute affective and schizophrenic disorders and admit admixtures of the two states we have a system sufficiently labile to include all cases, and we are not bound to prognostications which the facts do not warrant.

In reviewing the cases we have come to the conclusion that the errors of diagnosis were to be explained along the following line: (*a*) The affective disorders were not recognized as such unless they existed in "chemically pure" form. (*b*) Schizophrenia, as a benign psychosis, was not admitted. (*c*) Acute fear reactions with confusion, hallucinosis, and sometimes disorientation were fairly uniformly regarded as praecox. (*d*) Little attempt was made to understand the cases as reactions in terms of personality, conflicts and wishes; that is, the "surface" content was not given due weight.

A. AFFECTIVE DISORDERS

In the group of the affective disorders was found, by far, the largest number of errors. Records will be presented to illustrate the factors which it is felt should have given the clue to diagnosis. Each case offered has received at least one diagnosis of "dementia praecox." No claim is made that the material presented is either original or startling, but justification for publication of these observations seems to lie in the fact that the course and outcome of these psychoses are not in accord with the impression which these cases originally inspired.

Among the affective reactions three groups seem to have escaped recognition. 1. Psychoses in which depressive ideas, i. e., self-recrimination, ideas of guilt and inadequacy feelings, dominated the picture. Two cases illustrate this type of disorder.

Case 1.—J. A. W., man, aged 22, white, waiter, with nothing of interest in his personal or family history, when seen first at Camp Hospital, Nov. 23, 1918, was reported by a noncommissioned officer to have been restless and troublesome on the voyage to France. He had threatened suicide and refused to mingle with his fellows. His records state that he appeared depressed and moody, but there is no mention of the soldier's statement of affect. He said he had no confidence in his abilities and was unable to stand the strain of life. His mental processes appeared slow. On November 27, the patient was described as very quiet and talking only when spoken to. He appeared very nervous and spoke of worrying about his family and his own inability to make good in the army; he complained that he had no self-confidence. He answered questions slowly; there was no evidence of hallucinations or delusions at this time. On January 12, the patient stated that he had always been seclusive and not like other people; he felt inadequate and said he did not want to live because he was not smart enough; he was afraid that he was no good. When admitted to this hospital on Feb. 21, 1918, he gave a clear account of his illness. He thought that he was sent to the hospital because he could not get along, and because everything worried him. He attributed his trouble to a nervous breakdown. The patient was slow in speech and action, but gave no definite expression of depression. He has now completely recovered and shows no evidence of his old feelings of inadequacy, slowness of speech or action.

At no time should the psychosis have been regarded as ominous or schizophrenic. His slowness and lack of contact with people was apparently due to his inability to break through his depression while his talk and ideas were centered upon his own inadequacy. There is no evidence of projection or incongruity in the picture.

Case 2.—P. M., man, aged 26, white, watchmaker, with one year's high school education, was excessively alcoholic and had a gonorrheal infection at 19 over which he worried a great deal. He was drafted June, 1918, and got along well while in camp. He was sent overseas in September, 1918. While there he drank rather heavily and on one or two occasions became boisterous, noisy, and impertinent to his company commander. He was admitted to the hospital Jan. 11, 1919, "in a more or less negativistic state, which persisted for eight days. He talked little or not at all and when he did, was much retarded. He had attacks of apparent unconsciousness but there were no convulsive movements. He was oriented for time, but was not certain as to place." He stated that he had some disease in his system and that he was afraid that if he had anything to do with women he might give them the same sort of disease. He was well behaved on the ward, but he had numerous ideas about diseases, which to his mind accounted for his slowing down. He thought syphilis was responsible for all his troubles, and appeared somewhat depressed. In this hospital, on March 21, 1919, the patient was slow in movement and in speech. He rubbed his hands together and paced up and down the ward. He looked worried and anxious, and feared that he may have infected someone with syphilis. He dreamed that he was at home and was no good. He said he could not stop worrying. The patient was correctly oriented and no memory defect could be demonstrated. He was very neat, kept his clothes clean and pressed and his hair was well combed. He responded to questions very slowly and appeared thoughtful and preoccupied. In April he was interviewed again and said he felt that he was not wanted here in

the hospital; that he had done wrong because he had not attended church when there were so many churches to go to. He said: "It's my own fault, it's all my own fault, I think that my trouble is caused by that disease which I have." When pressed for an expression of affect he replied, "I feel sad."

All the ideas expressed concerned the patient's own inadequacy and feelings of guilt. He accepted all feelings of guilt as the result of his own misconduct and did not attempt to make the world stand the brunt of his own feelings of incompetence. What was described as negativistic seems likely to have been a stupor-like state which is so frequently seen in profound depression.

2. Psychoses which showed all the mechanics of depression, that is, difficulty in thinking, slowness in stream of talk, inactivity, were mistaken for schizophrenic slumps with apathy.

CASE REPORT.—D. H., man, aged 24, white. After finishing college in 1917 had a "nervous breakdown" in which he had marked feelings of incompetency; became "morose," depressed and contemplated suicide. He felt he was unable to be of any consequence in life; that he could not concentrate on any subject, and had a subjective sense of confusion. Although interested in chemistry and agriculture, he could not force himself to seek a position in keeping with his training and attainments. He therefore took a job in a mill, earning $14 a week. He had practically recovered when he was drafted into the service. Shortly after his induction into the army, his slowness returned. When seen in a hospital overseas on August 18, he was described as "showing marked lack of interest, with marked hesitation in answering questions; appeared dazed with clouding of consciousness and disorientation for place and time." (We are inclined to doubt the statement as to disorientation because the soldier recalls accurately all hospitals in which he has been.) He is said to have had much "disturbance of association" and retardation, as well as to have been actively hallucinated, although no description of hallucinations was given. A week later, at another hospital, he stated that he was no good to the army because he had not started right. He slept poorly and worried because he was "mixing everything up," and expressed a desire to die. His replies to questions were extremely slow; there was no spontaneous speech, and his slowness was described as "dulness and apathy." On admission to this hospital on Oct. 18, 1918, he is said to have appeared indifferent and apathetic. He was "pessimistic about his future, complained of lack of confidence, and could not see how he could be of any use in the world." In February his speech and actions were still slow. In the early part of March he was more cheerful, and worked as clerk in the canteen, but still gave expression to his inferiority feelings. When interviewed again in the latter part of March he had a subjective feeling of difficulty in thinking, looked worried, was slow in talk, and described his mood as "somber." He showed a morning-evening variation in his difficulty of thinking and slowness of speech. At that time he gave a history of his early youth. He has always been sensitive and has worried a great deal about masturbation. He had nocturnal enuresis until 14 years of age, but this disappeared after an operation for varicocele. He felt, as a boy, that his masturbation had permanently injured him, and that it prevented him from developing a strong will or a fixed view in life. He realized, as he grew older, the part that sexual ruminations have played in his inability to reach out to a mature standard, but showed nothing

suggesting projection or abnormal submersion of his auto-erotic difficulties. At the present time the patient has practically recovered. He is cheerful and is in sole charge of the canteen from time to time.

While the patient's type of personality suggests fertile soil for a schizophrenic development there had apparently always been sufficient affect to swing him along. His slowness and difficulty of thinking appear to have been mistaken for apathy. His ideas at all times were consistent with his own feelings of inadequacy. The failure to see the case as an affective disorder was due to the fact that the affect was not on the surface and the mechanics were not given sufficient weight. Many case records show this same failing. Patients were repeatedly described as apathetic and disinterested because their reactions were slow; few records contain mention of affect and practically none give the patient's own words concerning his mood and feeling. In the next group is seen the tremendous importance of mood deviations as a leavening factor in the course of psychoses in which projection phenomena are prominent.

3. In affective disorders with schizophrenic features too little attention was given to the emotional setting in which the psychotic development took place.

Case 1.—P. C., man, aged 27, a white laborer who had reached the fifth grade in school had a negative family and personal history as far as is known. He enlisted May 6, 1917, but for some reason was not sent overseas. In June, 1918, while in camp he developed measles, making an uneventful recovery. A short time after the infection he began to tire easily, his speech became slow and difficult, he could not sleep, was restless and became apprehensive and suspicious for no apparent reason. He was reprimanded by a noncommissioned officer for slowness and was told that the former would hypnotize him in order to put life and action into him. In October he was granted a pass to go home. On his arrival he felt peculiar; his eyes seemed green, and he felt as if they were being drawn together. He attributed this to the fact that someone had hypnotized him and was exerting an influence over him. He thought that this person was someone in his company. Therefore he returned before his pass had expired to discover who it might be. He complained at this time of a heavy and sluggish feeling about his heart. Soon after his return he began to feel that he could hypnotize others; that the men in his company were talking about his actions; that they disliked him and were going to try to poison him. In addition, he felt that he was being talked about and that many remarks were being made behind his back.

He was admitted to this hospital Dec. 18, 1918, giving at that time a clear account of his illness. He appeared depressed and said that he felt "sad." It was with difficulty that he could be made to smile and he spoke in a slow, hesitating manner. He complained of difficulty in thinking. He was well oriented and his appearance was neat and tidy. On February 15, he was discharged as completely recovered. His depression and slowness had entirely disappeared, and he realized that his ideas had been wholly imaginary. At no time previous to admission to this hospital had any notation been made concerning his mood.

We have, then, a reaction which would have appeared as extremely ominous, i. e., with ideas of reference, influence and a sense of body alteration, had there been no frank affect; but the definite statement of sadness, with his slowness and difficulty in thinking made the outlook relatively benign from the beginning.

CASE 2.—P. A., man, aged 23, white, with meager education and an insane mother, is said to have had "fear attacks with ideas of impending death" at the age of 5 or 6. He also is said to have had "spells"; there is nothing in his later history, however, to suggest epilepsy. He has shown a roving disposition, being unable to settle down to any one job for any length of time. In fact, he has had so many different kinds of work, and each for so short a period that he is unable to name his occupation. He was admitted to a hospital overseas on Aug. 21, 1918. There he was described as follows: "He appears dull and not very much interested in environment, talks slowly and ideation is slow." Said "someone is trying to take my thoughts away, and that the company commander was saying things about him. He also felt that he could tell what other peoples' thoughts were. Said he had been doped. He is rather sad and has loss of emotional tone." Two weeks later at another hospital he said, "They have tried to give me poison to do away with me because they thought I was a German." He admitted hearing voices but there was no statement as to the content of his hallucinations. He was sorry that he had talked so much. On admission to this hospital, Oct. 7, 1918, he appeared depressed; said that he was "taken for a spy and a German"; he felt that his company thought that he was trying to do things detrimental to them; that the night watch could tell about him as he slept. At one time he imagined that poison had been put into his food; also that his thoughts were being read. He stated that he had been depressed, but felt better when interviewed. On discharge, in March, he spoke of his psychosis as having been "imagination and junk." His depression had entirely disappeared and he denied any ideas of influence, reference or persecution. His old roving disposition reasserting itself, he went away without leave on a number of occasions, but while in the hospital did excellent work in the shoeshop.

Although the affect was in the background, it gave sufficient evidence that his ideas of influence, reference and persecution, together with his apparent disinterestedness, were to be regarded as less ominous signs than one would ordinarily be inclined to believe.

CASE 3.—X. Z. Certain facts which might serve to identify the patient are omitted for obvious reasons. The patient is a young woman who was reared in an austere, religious atmosphere, in which dancing, card playing and theaters were strictly forbidden. She describes herself as sensitive and self-depreciatory; for example, she could not understand what her husband had seen in her to have married her. She admits that she always had a tendency to day-dreaming and found it easier to build air castles than to obtain her satisfaction from reality. She was married a year and a half ago, and one month after marriage noticed a vaginal discharge which was diagnosed as gonorrheal, but no smear was made to confirm the diagnosis. A sense of modesty prevented her from taking her husband into her confidence. As it had been her greatest ambition to bear children, she worried tremendously for she feared she might be sterile. When her husband went overseas she threw herself into war activity with great fervor and enthusiasm. Toward the end of March she began

to feel tired and attempted to bolster her strength by drinking large quantities of coffee. Her friends noticed that she seemed very happy, and she describes her mood as one of elation. No amount of work seemed too great for her. A short time previous to onset she had read a story in one of the current magazines about automatic writing. (During the period preceding her elation she had some notions that her physical fatigue might prevent her from being in fit condition to bear children on her husband's return. Her husband's mother had been opposed to her marriage.) She decided to make a trial with automatic handwriting and discovered that through this medium she could commune with God and her husband's father, to whom she had been greatly attached and whom she nursed during his last illness. She was told that if she was humble in spirit and pure in heart she would have many children and bring joy to her husband. She soon found that it was no longer necessary to use handwriting as a medium because she could communicate directly with God, Jesus Christ and the Holy Ghost. She was found, on March 31, lying naked on the floor; she appeared unconscious, although she stated after her recovery that she knew definitely what was going on the entire time. Her reason for this action was that she had been told that if she washed herself and appeared humble in the sight of God she would have many children. "When she was examined the next day she was 'loquacious and euphoric.' She said she had been dead for several hours during which time she was in the presence of Jesus Christ; that she had purified her heart and been born again. She refused to divulge the nature of her interview with God, and insisted that the examiner was not pure enough to receive the information. She became angry at the examiner when he asked her if she had made any efforts to prevent conception and stated that she could read his brain and knew that he meant to offend her. Her attitude at that time suggested exaltation. She laughed during the examination and gave the impression of elation."

On admission to this hospital she showed practically no signs of any psychosis. She gave a clear and cogent account of the episode and after a few interviews, in which an attempt was made to point out the relation of the content of the psychosis to her longing and ungratified wishes, she accepted the point of view, was able to understand what each of her ideas had stood for, and abandoned all notions of the reality of her spiritual communications.

This fantastic flight into spiritualistic and occult phenomena with ideas of mind-reading, exhibitionism and eroticism is the material out of which schizophrenic development is ideally woven. However, all of the content of the psychosis when viewed in the light of the elation and exaltation takes on a benign coloring.

B. SCHIZOPHRENIC DISORDERS

The next group, that is, benign schizophrenia, comprises a much smaller number of cases, but does include a sufficient number to warrant their presentation. We place in this grouping patients whose symptomatology is in no obvious manner different from those cases which form the classic group of dementia praecox. We see, in the schizophrenic development, a mechanism which Bleuler has designated as "autistic thinking," i. e., a withdrawal from reality, into a world of fantasy, with projection of that part of the personality, which is not

tolerable, onto the external world. The extent to which this withdrawal takes place, with the necessary internal readjustments which appear objectively as bizarre activity and thought, determines the profundity and seriousness of the disorder. The factors which make for good are the patient's ability to be aroused to normal emotional responses, to be able to understand the psychosis in terms of conflicts and precipitating causes. The precipitating causes of the withdrawal are potent factors in estimating the hope of return to the real world of fact and recovery. In the war cases the prime motive for this flight from reality could, in the large majority of cases, be removed, and it is our impression that it was principally in those cases in which the conflict was closely associated with the instinct of self-preservation and the inferiority complexes brought out by the war, that startling recoveries were noted. Again, we do not claim that there is anything new about the recognition of this group. The war, however, did give us "stress and strain" in condensed and powerful form, and therefore performed for us, as it were, a large number of "experiments."

CASE 1.—D. M., negro, aged 38, steward and cook who drank alcohol in moderation, gave a negative family history with gonorrhea at the age of 33. After his graduation from high school he became a steward in a private club, and went into the catering business for himself seven years later. He failed after three years' trial and gave a history of a nervous breakdown at that time. He was "nervous and suffered from indigestion." We have no record of any more serious psychotic disturbance at the time of his failure. He spent a few months at Hot Springs; made an uneventful recovery and returned home, securing employment as a waiter.

At the age of 32 he married. The marriage was unhappy and his wife finally secured a divorce, after numerous attempts at reconciliation had been made. The patient maintains that his wife was unable to satisfy him sexually. In November, 1917, he enlisted, and was sent overseas in April. While still in this country he was "nervous, dissatisfied, and had stomach trouble." He had trouble with the men of his company because of his attitude of superiority and his higher education. In May he wrote his company commander complaining that the other men in his company were jealous of him and "had gotten on his nerves." He asked to be sent to penitentiary as life was miserable for him, and stated that his only desire was to get to the front to earn a commission. (He was serving as a mail clerk in a labor battalion.)

When admitted to a hospital he thought that the adjutant disliked him and that a sergeant had mistreated him, making threats against him. He maintained that a roentgen-ray picture was taken of his head to show that he was insane. He regarded his transfer from hospital to hospital as an attempt to get him out of the way. He thought he overheard officers and other patients talking about the commission which had been given him. Although he admitted that no one had ever told him directly that he had been given a commission, he insisted that many times he had heard people say, "That is the man with a commission." He thought that there was some plan to get up a political campaign against the governor of his state, and he was told to prepare speeches against it. He then developed the idea that machines had been put

around his head to obtain his speeches. When examined at this hospital he insisted that he had been given a commission in the Medical Corps and asked for permission to go to Washington to discover why the commission had not arrived. He felt that certain army officers and high officials were against him. On one occasion he heard the voice of a woman calling him from the second floor of the Administration Building; later he thought that a system of mind-reading had been adopted to prevent his leaving the hospital. He spoke of having been given three commissions, medical, infantry and quartermaster; he said that everyone could tell what he was thinking by mind-reading and that the other patients on the ward "tapped out" his thoughts. His explanation for receiving a commission in the Medical Corps lay in the fact that "medicine comes natural to me." On one occasion he offered to fight an officer if he would remove his bars because he had been asked what kind of a mason he was, and felt that there was some hidden significance to the question. On the street he heard people remark, "There is monkey-face; they are making a monkey out of him." At all times he was correctly oriented, his memory was good, and he gave no expression of affect that showed any departure from the normal. He was always neat and orderly, and took excellent care of his clothing. Military manner and bearing were well maintained, and he worked willingly at whatever work he was asked to do. When allowed to leave the post on pass, he returned promptly and never got into any trouble. On several occasions he was persuaded that his ideas were imaginary. Finally, after a furlough in which he renewed his contact with his old friends and interests, he abandoned these ideas completely and came to recognize them as a response to his old feelings of inadequacy and discontent, and as the fulfillment of a wish.

At first his delusions, passivity feelings, ideas of reference and tendency to misinterpretations made one uneasy as to the outcome of the psychosis, but the fact that he always worked readily, was interested in the activities of the post, was careful about his personal appearance, and that there was little tendency to rumination and day-dreaming with inactivity, made us hopeful that there was sufficient material on which he could rebuild.

Case 2.—I. F., private, white, aged 23, clerk, single, had nothing of interest in his family or past history. About the first of December he began to feel sick. In the morning when he arose he felt dull and dizzy; he complained of seeing things double and had pains all over his body; he slept poorly and could talk only with difficulty. He was given aspirin for several days, but did not improve. Finally he was sent to a hospital, but his physical examination showed no abnormalities, and at no time was there any sign of an acute infection. When seen in the hospital he showed marked indifference to his surroundings, lay for hours in one position, and held his body rigidly. He resisted any attempts to change his body position, but when finally moved maintained any position in which he was placed. He was well oriented, giving adequate response to all questions which were asked of him. He wet the bed, had to be spoon-fed and drooled saliva constantly. After three weeks he improved, but gave a meager account of his illness. He said he thought that he had been paralyzed. At no time was there any evidence of delusional or hallucinatory experience. On admission to this hospital March 7, he had recovered completely. He recalled the facts of his illness, but could give no explanation for his psychotic episode.

One would have suspected *a priori* that many such "acute catatonias" would be seen, but up to date very few have been observed in this hospital, and this case is the only one that has made a recovery. The absence of projection phenomena and the acute onset might have suggested the benign course of the episode. At first the case gave the impression of an obscure, infectious process, but the drooling of saliva and the incontinence in the absence of any confusion or delirium would seem to exclude this possiblity.

CASE 3.—L. K., private, aged 30, machinist, moderately alcoholic, single, with a negative family and personal history. was born in Russia, and came to the United States in 1909. He worked regularly as a machinist, earning as much as $3.25 a day. He was drafted Oct. 7, 1917, going overseas in June, 1918, although he saw no active service at the front. On Sept. 16, 1918, he was admitted to the hospital complaining of pain in the chest which he thought was the result of poison put into his coffee. He thought that the sergeant in his company was against him, also that the men in his company had been influenced against him. For this reason they undertook to poison him. He thought that gas and electricity had been put into his bed; he heard that his money was to be taken away from him. On awakening one morning, he told the ward attendants that there was blood around his umbilicus; that his blood had been spoiled; that syphilis had been given him, and that his semen had been drained away. He imagined that his picture was being taken wherever he went. After a few days his delusions appeared to quiet down, but one night he awoke and accused the nurse of trying to poison him, and said that electricity was put into his bed to make him jump. There was no frank fear except that exhibited by refusal to go to bed because of electricity or to eat because of poison.

When admitted to this hospital, Dec. 6, 1918, he was disinterested, and on questioning gave the same delusional system as obtained overseas. No expressions of affect could be elicited and the soldier's expression or appearance gave no evidence of fear. Feb. 18, 1919, he had made a complete recovery. The mental status at this time showed no abnormality except that he claimed amnesia for the period while in France. He worked at various jobs about the post and said that he felt better than when he entered the service.

It is a striking fact that a large number of cases seen in this hospital have occurred in soldiers who are either foreign born or who cannot speak and understand English adequately. At present sixty of the 240 patients in this hospital are either foreign born or have serious language difficulties. A possible explanation for the large number of such psychoses may lie in the fact that foreigners are usually the object of jokes and bantering. Unless associated with others of the same race, they were apt to have little social contact and in many instances were ignorant of the causes of the war, and what they were fighting for. It is probably true that the general material from which immigrants are drawn is below par; at any rate, the observation is striking.

These three cases illustrate, in relatively pure form, what has been seen in fragments in a much larger group. The impure form contains

delirious elements, initial periods of confusion and bewilderment with various admixtures of delusional and hallucinatory projections. The content of these psychoses concerned itself with fundamental instinctive disability, and gave evidence of profound conflicts. It cannot be too strongly emphasized how important it is to recognize the benign nature of many of these disorders; all that there was of confusion and delirium should have been noted as favorable. Much of the hallucinatory experience was on the surface and concerned itself with visions of home and family, the voices of friends and relatives.

C. ACUTE CONFUSIONAL, HALLUCINATORY DISORDERS WITH FEAR

These impure forms graduated into a group which seemed sufficiently well defined to be set off by themselves, i. e., the cases of acute confusional, hallucinatory episodes with marked fear. It is true that we have little understanding of this group which has been called toxic-infectious in the presence of definite, known etiology and "amentias" in its absence. While the content of many cases of this group was very much on the surface, a number showed reactions which suggested that the very roots of the personality had been stirred. Many cases showed considerable affect so that, had there been no records of initial disorientation and confusion, one would have classified the cases as affective. Stupors were quite common in this group.

CASE 1.—S. C., corporal, aged 29, white, mill hand, was alcoholic until 1916, but has not used alcohol since. His mother is said to have been nervous. He had only a meager education. In 1914 the patient had a "nervous breakdown" lasting three months, at which time he was "very nervous"; had sensations of "flashes" passing through his body and involving his spine; was restless and unable to work. He made a complete recovery from this attack. In June, 1916, he enlisted and was sent to the border. He became nervous occasionally but did not have to go to a hospital on this account. He was sent overseas, and after a short time his organization moved to the front. In July, 1918, it is reported that he was knocked over by a shell, became unconscious, and was sent to a hospital. When seen at the casualty clearing station, he was confused, could give no account of himself, and had a "wild and anxious expression." His confusion disappeared after a few days, but he complained of weakness and his talk was rambling and "irrational." He was transferred to a hospital in England and there showed considerable emotional instability and some perplexity. He thought he was going to be killed, that electric batteries had been placed in the ward to kill him, and that his grave was being dug outside. He was recommended for discharge on a diagnosis of dementia praecox. When admitted to this hospital, Oct. 7, 1918, the soldier was entirely well. He recalled his feeling of intense fear, but claimed that he had no memory for the initial period of confusion or rambling talk.

CASE 2.—R. G., private, aged 24, oil chemist, indulged in alcohol to intemperance at times, but gave no history of excess overseas. Prior to enlistment

he had done excellent work as a commercial chemist. There was no history of any previous mental trouble. After arriving overseas he was sent to the front, and there was a history of his having been sent to a hospital several times for hypochondriasis. On Nov. 20, 1918, after having been lost for about a week, he was discovered wandering aimlessly about, and when taken to the hospital gave a history of having had a headache and pain in the legs for a week previous. He had been unable to sleep. Three days later he became fearful, easily startled, thought he was to be injured and that soldiers were pursuing him in order to shoot him. He said his food tasted queer. He was completely disoriented and was described as apathetic, slow, retarded and irritable. His "memory was poor, and he was untidy." On Dec. 7, 1918, the patient rushed out of the ward, saying, "they are after me." He secured an axe and struck a prisoner over the head, fracturing the skull, and accused the prisoner of having killed his father. He continued to refuse food, saying, "you have me now." While being evacuated to another hospital he tried to escape in order to avoid his persecutors. His disorientation continued, and he ran up and down the ward banging his head against the wall. He persisted in his delusions about his food and the attempt to kill him. He was untidy and incontinent, and gave the impression of great fear. His sleep was disturbed by terrifying battle dreams. On admission to this hospital, Jan. 10, 1919, he appeared confused and depressed. He complained that he lacked ambition; was unable to concentrate, and thought that his memory was poor. At this time, however, he was correctly oriented, and showed no evidence of fear. His talk and response to questions was very slow, and he was not readily accessible. The depression and slowness, however, gradually disappeared and he was discharged in March as completely recovered. His mental status at this time was normal. He showed correct orientation, no affect, and complete insight into his delusions and psychosis. He was alert, bright, showed no memory defect, and was ready to take up his job as a chemist.

A question, which for army purposes is of great importance, arose in this case, and gave us warning that one should accept facts of the history, taken during the psychosis, with caution. He gave a definite history that two years previous he had had a similar mental upset. His family, who were most anxious to cooperate, denied this, and were unable to give any facts that might have been construed as a psychosis. On his recovery the soldier also denied any previous breakdown. Obviously "line of duty" questions are seriously involved, and one should in justice to the soldier, accept only such history as seems beyond peradventure.

Case 3.—M. P., private, white, garage worker, whose father was moderately alcoholic, also drank in moderation. He was a "delicate child" and had "fits" from the age of 5 to 12. He reached the sixth grade in school. He was sent to France in December, 1917, only to develop "stomach trouble" as soon as he arrived overseas. He was on sick call constantly and in July, 1918, developed tremors, growing more and more "nervous." In August he became confused, disoriented, losing himself on several occasions. His statements while in the hospital were quite inconsistent; he spoke vaguely of having been deafened by the noise of motors and appeared frightened and anxious. He was lachrymose, inattentive, seclusive and unresponsive to questions. His condition was much improved after three weeks and he asked to be sent back to his outfit.

This request was made at an evacuation hospital where it was generally understood that soldiers were not returned to the line. When seen at this hospital, Oct. 7, 1918, he had completely recovered. He gave a clear account of his illness and verified by definite statements the fact that he was fearful.

CASE 4.—G. A., private, aged 31, mill hand, white, born in Italy, was moderately alcoholic and, until his present illness, was never in a hospital. He was drafted in April, 1918, and was sent overseas the next month. Throughout his army career he worked in the kitchen, and did not participate in any engagements. He gave a history of having been gassed in October, 1918, but the medical officer who observed him first made no note to this effect. When first seen he was confused, wandered aimlessly about, was unkempt and dirty. He appeared anxious and frightened. A few days later he gave a history of having had bad news from home and of having worried a great deal on this account. The voices of his mother and sister kept calling to him to come home. On occasions he became frightened and attempted to escape from what he thought was a jail. His talk was rambling and fragmentary. He wept frequently and developed an irregular tic of head and facial muscles. Later he gave a history of constant fear that something terrible was going to happen to him. On several occasions he was disoriented but the disorientation does not seem to have been constant. When admitted to this hospital, Jan. 21, 1919, he was correctly oriented, alert, gave a clear account of his illness, showed no affect, and there was no evidence of confusion. He was discharged ten days later as completely recovered.

It is interesting to note that "gassing" has become as respectable a cause of mental disease as "shell-shock." Almost every recovered case until the signing of the armistice gave gassing as one of the causes of the illness.

To summarize the foregoing groups it may be said:

1. The affective disorders were unrecognized in the cases in which (*a*) ideas of guilt, self-recrimination and inadequacy statements dominated the picture, rather than frankly expressed depression; (*b*) the mechanics of depressions, i. e., difficulty in thinking, slowness in the stream of talk and inactvity were the prominent features; (*c*) schizophrenic elements were present. Too little weight was given to the emotional setting of this group.

2. Benign schizophrenia was not correctly prognosticated because: (*a*) The acute onset was not taken into account; (*b*) the patient's capacity for activity and interest was ignored; (*c*) there was no realization of the fact that the existing cause of conflict could be more readily removed than is usually the case; (*d*) the patient's ability to understand the psychosis and its causes, and his ability to make necessary readjustments was underestimated.

3. In the acute confusional hallucinatory psychoses with fear, too little weight was given to the elements of confusion, delirium and affect.

The foregoing cases were selected from a large number, all of which were diagnosed as dementia praecox.

Two other groups of cases seem sufficiently interesting to deserve comment. First: a surprisingly large number of acute paranoid developments have been seen. Some have appeared with affective background, and others without. The occurrence of paranoid trends has been very frequent throughout all the war psychoses as observed here. One is led to accept the statement of Bleuler that paranoia is not the unusual disorder that institutional material would lead us to believe. Some of our cases which were originally on an affective basis have settled down to a delusional system without any affect, and this group lends some weight to the theory that paranoia is primarily a mood disorder. Other cases lend no support to this view and seem to have shown a pure "intellectual" disturbance from the beginning. The following two cases are chosen from a group of ten or twelve.

CASE 1.—C. T., coal and ice dealer, aged 27, had reached the seventh grade. He was moderately alcoholic, but not to excess at any time and had been nervous a year and a half before entering the army. About three years ago he had a breakdown which lasted for three months. He was afraid to leave his house at this time, was very "nervous," apprehensive and feared that he was going to die. He had cardiac palpitation, general body tremor, and showed great restlessness.

He was drafted in September, 1917, and was sent overseas in April, 1918. In August he became suspicious, thinking that he was being watched. He felt that the relatives of a married woman whom he had known illicitly in the states were in his company and were planning to do him harm. He began to watch the men about the kitchen. His own statement at that time was as follows: "They acted suspicious, and seemed to be laying for me. They were always watching me—watching my movements. I had the cooks with me and they (the conspirators) were apparently waiting for them (the cooks) to go away. They stayed all day, just watching and waiting for me. Then they returned to the company. That night I told my captain and he advised me to get a rest. The next day I was sent to the hospital, and the same thing started there. At night two men sleeping on each side of me flashed lights in my face and turned their wrist watches at me to show where I was lying. This kept up for four or five days. I could see them talking in conversation. They always appeared suspicious to me because they were all in one bunch. They sent me away to another hospital because I was afraid that they were plotting against me. There another gang started. They laid to get me. There is one fellow here who came with me, and I am suspicious of him. He started the trouble and there is somebody on my trail all of the time. It is because I had trouble back home over a married woman. Her husband started it back in the states. I was all right until two weeks ago. Then they found me here and started the gang after me. I am not getting a square deal, they follow me wherever I go and they are going to kill me. They bother me day and night so that I can't sleep because of them. They are always whispering about me. There is a conspiracy on to get me. The Italians are in it." The patient was said to have been apprehensive and suspicious, and to have shown considerable fear. He looked about anxiously. His records, however,

give no statements of the patient, himself, concerning fear. He could not be persuaded to abandon his delusional system and insisted on being evacuated to the states to avoid his pursuers.

On admission to this hospital, Oct. 7, 1918, the soldier showed no signs of fear, suspicion or apprehension. His behavior seemed entirely normal and he said that, while he did not fear his persecutors while in the army, he had an idea that they would try to persecute him in civil life. He could not be convinced that his suspicions and fears were imaginary. His attitude at this time was one of placidity. He talked freely about his delusions, but showed no fear of any sort. He fell into the hands of one of the other patients, and after a few days he asked to be allowed to appear before the disability board again. He seemed to be entirely converted by his friends, and stated that his ideas were imaginary, having no foundation in fact. While awaiting discharge he was questioned repeatedly and each time stuck to his position that the whole affair was psychotic. Persistent attempts to lead him to accept his delusional system again, were unavailing.

It is impossible to be sure whether the statements about fear refer to a dominating mood or whether fear was the result of the ideas of persecution. His delusional system at this hospital, however, stood free from any mood disorder.

Case 2.—M. C., aged 28, butcher, Italian, nonalcoholic, was born in Italy, and came to America in 1908, after four years' schooling in Italy. He was drafted in October, 1917, and went overseas in August, 1918. While working as a laborer he had some trouble with the men with whom he was associated. He thought that some of the men in his company were going to knife him or use a razor on him, he could not sleep because of the fear of being killed. He appeared very fearful and apprehensive and declared that he was no good; that the other soldiers were talking about him, and that he was going to be killed as a result of this. On October 21 he was described as talkative and excitable. He told the same tale of persecutions and admitted hearing voices telling him he was to be killed because he was no good to the army. There was no evidence of depression. When admitted to this hospital, Oct. 25, 1918, he showed no abnormality in his behavior or mental status. He denied any ideas of persecution, influence or reference. No expression of affect could be elicited. He showed little insight, however, but was willing to admit that his ideas were imaginary.

The second group is heterogeneous in the sense that it includes all types of reactions: schizophrenic, affective and confusional, but possesses this one common feature — the initial period shows symptoms of the so-called psychoneuroses. In our work we have followed Dana's and Meyer's notion of speaking of major and minor psychoses. The cases in which hysterical, psychasthenic, neurasthenic and anxiety symptoms occur in pure form shade insensibly into the fullblown psychotic developments. The army workers have attempted to separate the two groups — psychoses and psychoneuroses — probably because of the desire to prevent "the stigma of insanity" from being attached to patients whose adaptive breaks did not lead to total incapacity. When dealing with the facts of cases as we can understand

them—that is, of reactions of psychobiologically integrated organisms —we believe that no essential difference in mechanism, or even in the severity of reactions, can be made out on any large scale. Hysterical delirium may appear as praecox; anxiety neuroses may assume the ranks of agitated tension states with complete major psychotic pictures; psychasthenic symptoms may be mixed with profound depression, and neurasthenoid symptoms may progress to deteriorating schizophrenias. Such a phrase as "the insane psychoneurotic" shows the futility of attempting a classification of patients into these two groups which aim only at reaction tendencies. At this hospital, supposedly devoted to the insane, we have seen every conceivable variety of mixture of symptoms. At U. S. Army General Hospital No. 30, which was supposedly devoted to the psychoneuroses, a somewhat similar situation prevails. This, according to our notion, was not due to the carelessness of previous examiners, but followed as a corollary of this false division. We present two cases as illustrations. The first one seemed clearly hysterical at the onset, but apparently assumed a more automatic character, and readjustment took place at a deeper level. The second case was also hysterical and superficial at onset, but matured into a major psychosis with features that were distinctly ominous.

Case 1.—R. G. B., aged 30, painter, moderately alcoholic, who had reached the eighth grade, entered the service April 3, 1918, and was sent overseas in June. Early in August he was sent to the hospital, because of complaint of sharp pains in the cardiac region, palpitation and rheumatic pains in the left leg. He had occasional fainting spells with sensations of blackness before the eyes. A few weeks later he showed no improvement in his somatic complaints, and in addition began to show a lack of interest in his surroundings. He sat by himself and could not be aroused to any activity. He insisted that his heart had stopped beating and that his lungs had collapsed so that he could no longer breathe. He thought that his food did him no good. No expression of affect was elicited. When evacuated to this country he was described as "seclusive and showing a marked interest defect." When first seen at this hospital in October his apathy and disinterestedness continued, and the original diagnosis of dementia praecox was confirmed. At the end of November he was re-examined, and examination at this time showed him to be normal. He was alert, cheerful, interested and without complaint. He said he felt as well as ever. He stated that he was nervous before entering the army, and admitted that when he was taken sick he had just heard that his company was going to the front.

Case 2.—E. A. B., aged 22, white, moderately alcoholic, had a brother who had been discharged from the army on account of major hysteria. He had had periods of undue worry and has always been regarded as having a nervous temperament. These periods of slight worry and depression have usually been followed by slight exhilaration, but have not been sharply enough differentiated to suggest a cyclothymic process. He graduated as a dentist, but was unable to pass the state board examination. He was forced to marry his wife because

she was illicitly pregnant. The girl, however, was acceptable to him and to his family. While in the service he worked as a dentist, although he was not commissioned. Early in November he received letters from his wife saying that she was not getting on well with his family with whom she was living. She also wrote that she was pregnant, and thought she would die. This caused him some worry, and he felt that he ought to be back in the states. He arrived overseas in September, 1918. In the latter part of November, 1918, he had three attacks characterized by fainting with convulsive movement, but without loss of consciousness, sphincter control, or injury. He himself characterizes these attacks now as "hysterical." He feels "sure of this because they resemble attacks my brother had." He was classified as an epileptic and recommended for transfer to the United States. These attacks appear to have been very near malingering, or at least to be definitely in relation to a desire to return home. He knew that his brother had been discharged from the army on account of hysteria. While in the hospital his worry and depression increased. He began to think that people looked at his feet, and by this they meant that he was a sex pervert. He also thinks they called him a sex pervert. While en route from Tours to Savonay the idea developed that he had heart disease and paresis. He felt that he never would get well.

On examination here, March 21, 1919, it was found that he was alert and answered questions promptly and relevantly. He avoided discussion of his seizures, but when confronted with the notion that they caused his evacuation to the states and served a purpose he did not deny it, but smiled acquiescence. He wept when his "sexual perversion" was discussed. He gained control readily and laughed at his instability. His family insisted that he had always been as unstable as the foregoing indicates.

Although the emotional instability and lack of adaptibility indicate that we were dealing with a constitutional inferior, the transition from the surface psychoneurotic episode to an affective psychosis with ideas of reference is evident and suggested an ominous coloring.

CONCLUSIONS

Our study of some of the "war psychoses" revealed that:

1. Affective disorders were frequently mistaken for dementia praecox.

2. Psychoses showing typical schizophrenic development had recognizable benign features.

3. Acute confusional hallucinatory psychoses with fear were incorrectly diagnosed as dementia praecox.

4. Acute paranoia was a relatively common psychosis.

5. The distinction between psychosis and psychoneurosis is untenable.

We wish to express our thanks to Lieut.-Col. William H. Smith, M. C., U. S. Army, for permission to study these cases, and to Dr. Adolf Meyer of the Johns Hopkins University for his advice and kindly criticism.

Abstracts from Current Literature

THE SYMPTOMS OF ACUTE CEREBELLAR INJURIES DUE TO GUNSHOT INJURIES. Gordon Holmes, M.D., Brain **40**:461-536 (Part IV, Dec.) 1917-1918.

As a catalog and dictionary of the signs and symptoms of acute cerebellar disease, this article can be judged to be as complete and satisfactory as is possible at the present time. While there do not appear any marked contributions to our knowledge of cerebellar function, yet it serves a useful purpose in its minute and painstaking analysis of the disturbances which may follow injury to the cerebellum. There must perforce still remain much work for the "hewers of wood and drawers of water" in the future before we are able to identify the real inwardness and essence of the organ in question. In clearing the ground for further advance and clarifying our thoughts on this most difficult of neurologic problems, the work of Gordon Holmes should be sure to sow seed which shall be reaped at some future time.

The article, following the custom of the more pretentious contributions to *Brain*, is divided into an introduction and chapters. The first chapter is devoted to a most minute analysis of the disturbances as studied in a number of unilateral cerebellar wounds received in the past war, and comprises over one half of the space covered by the entire article, the remainder of the article being concerned with wounds of the vermis, bilateral injuries, wounds of the cerebellar nuclei, the nature of the symptoms produced, the chapter being directed toward an understanding of the underlying principles, and finally a chapter on cerebellar localization.

There are a number of illustrations and graphs showing tracings of movements as influenced by cerebellar damage.

In the introduction the author emphasizes the difficulty experienced in reconciling his clinical studies with the results of experimental investigation on account of the impossibility of correctly and accurately estimating neighborhood effects and the infrequency of clear-cut pictures. His studies were based on over forty individuals, twenty-one of whom were studied over relatively long periods of time. The greater number of cases presented unilateral damage.

Chapter 1, on unilateral lesions of the cerebellum, is divided under eleven subheadings:

(*a*) Disturbances in Muscle Tone: The motor side receives the main effect of cerebellar damage, and tone in particular suffers. The muscles are soft and flabby on palpation; they can be displaced, compressed or stretched without pain or discomfort to the patient. The normal resistance to passive movement is lost, and movement is limited only by bony architecture and ligamentous check action. Although the movements are allowed abnormal range and resemble those seen with flail joints, there is no ligamentous relaxation. This loss of tone is uniform throughout the limb or limbs, the result being as great distally as proximally. It appears early, from five to ten days after the receipt of the injury, and may persist for several weeks. Decrease in the tonelessness is uniform, there being no anisosthenia which was sponsored by André-Thomas.

(*b*) Disturbances of Voluntary Movement: There is present a definite asthenia, slowness in initiating contraction and relaxation as shown by graphic records, and a much greater expenditure of energy to accomplish a definite end as compared with the normal side. Dynamometric readings show a decided loss of power in even the simplest acts where the factor of awkwardness would play the smallest part. A more prompt fatigability appears and manifests itself in irregularity and jerkiness in the application of the force; this may be attributed to the voluntary efforts to overcome the results of fatigue. Static strength that is the maintenance voluntarily of position seems unaffected. There is a decided reluctance to movement of the affected limb which is present even in the stage of excitement in anesthesia. Electrical stimulation of the muscles shows no loss in the promptness in muscular response, and there is no lengthening of the latent period after the application of the current.

1. Delay in initiating muscular contraction.
2. Delay in attaining the exertion of the full force.
3. Delay in commencing relaxation.
4. Delay in effecting relaxation.

All muscle groups are affected uniformly; there is no limitation of the range of movement, no rigidity and no contractures.

The ataxia present may be studied to the best advantage early before compensation by other motor mechanisms takes place. Vision plays no part in cerebellar ataxia. Movement is less prompt; the member sways and deviates from the proper line, the movement is less accurate, is performed with undue force and the ataxia is increased by haste. These results seem to depend for their existence on the disturbed action of the nonmotofacient musculature, the fixating muscles at the joints.

An analysis of the ataxia shows:

1. Decomposition of movement. Improper coordination of the various components of a movement.

2. Asynergia. Failure of coordination between the agonists, the antagonists and fixating muscles.

3. Dysmetria. Failure of the check element which again is lack of coordination between synergists.

4. Tremor. Usually at the end of a movement and resembles intention tremor of multiple sclerosis, again irregular coordination of synergistic muscle groups.

5. Deviation from the line of movement. Failure of the nonmotofacient components.

The more complex the movement, the greater will be these phenomena.

The rebound phenomena receives a special place of its own, although it is merely another example of the asynergia, the loss of the check element.

Adiadochokinesis is manifested by an inability to perform alternate movements in rapid succession, the rate, range and regularity of sequence being lost. Instead of the orderly alternation of contractions, there appears an awkwardness and irregularity due to the disturbed action of antagonistic and synergistic muscle groups and the addition of unnecessary adventitious elements. The tonelessness of the muscles and the slowness of contraction and relaxation contribute their shares. Contrary to the normal, there is a greater ease in performing movements with one hand at a time instead of with both hands synchronously. This is equally true of coarse and fine movements.

(*c*) Static Tremor: The swaying of the head and body present in cases of cerebellar injury is due to irregular and discontinuous muscle action. The posture of the limbs once attained is usually well maintained and, in fact, it may be better sustained than on the normal side, which recalls the state known as "cerebellar catalepsy." The fine, vibratory tremor normally present is absent. With fatigue, a coarse tremor appears which is due to the effects of the increased fatigability of the muscles and the efforts toward voluntarily resuming the ordered attitude.

(*d*) Vertigo: This is present usually in early cases, the rotation being from the affected toward the normal side. The patient lies on the affected side with the head rotated toward the unaffected side and the ipsilateral shoulder advanced, which may be interpreted as a latent tendency toward rotation.

(*e*) Spontaneous Deviation of the Limbs and Bárány's Pointing Tests: If the eyes are closed, the affected arm will almost uniformly swing slowly outward, and past pointing will always follow the same trend.

(*f*) Attitude: This feature, so striking in experimental animals, is much less marked in man. The head is retracted toward the affected side, but rotated toward the normal side; the body is concave toward the affected side, and the ipsilateral shoulder is advanced. The ipsilateral limb influenced by gravity will be abducted, rotated outward at the shoulder, and pronated at the elbow.

(*g*) Standing and Gait: The patient will sway toward the affected side, with the head and trunk inclined in the same direction and the spine concave toward the injured side, the weight being mainly carried on the contralateral leg. The ipsilateral shoulder is advanced. The patient, if pushed, will fall more readily when he is pushed toward the affected side. There is no Romberg. If the attention is distracted, standing becomes more difficult. In the gait there is difficulty in maintaining the equilibrium, stumbling and falling toward the affected side. In walking, the patient constantly tends to deviate toward the side of the injury. The affected leg evidences a tendency suddenly to fail the patient, and will give way most unexpectedly.

(*h*) Disturbances in Ocular Movement: These are present only early after the injury, and consist in a deviation of the eyes toward a "rest-point," which lies away from the affected side. Movements toward the affected side are slow and performed with considerable effort. A skew deviation was observed in five cases. A nystagmus of fixation is present, more pronounced in looking toward the affected side, the eyes tending to drift away from the point of fixation and toward the "rest-point," only to be brought back by the sharp volitional component. The rate is about twenty-three to thirty jerks per 10 seconds. There is usually no nystagmus on vertical gaze or during convergence. It is more rapid, finer and less regular when the eyes are directed toward the unaffected side. The nystagmus increases the farther the gaze is directed away from the rest-point.

1. Nystagmus of fixation, slow phase toward the rest-point.
2. Increased by looking toward the affected side.
3. Gradually decreases.
4. Differs from labyrinthine nystagmus, which is present at most for only a few days; the slow phase is always toward the affected side, and by the fact that cerebellar nystagmus is increased by lenses which cut out fixation.

(*i*) Disturbance in Speech: Speech is slow, drawling and monotonous, sometimes staccato, scanning or explosive. Phonation is more affected than is articulation.

(*j*) Reflexes: These are diminished, being more feeble, less brisk and elicited with greater difficulty. Summation is often necessary before the reflex can be obtained. The latent period of 0.043 second is the same in the normal and the affected limb. The fall of the limb is much retarded, owing to the retarded relaxation of the quadriceps extensor. In the normal leg the ratio stands as follows: Rise: fall: 1: 1.2 or 2.2, whereas in the affected limb, rise: fall: 1: 0.85. Owing to the absence of tone and the check elements, a series of oscillations result before the leg comes to rest, the pendular knee-jerk of André-Thomas. As a result of the absence of the check element of the hamstrings, if the patient is lying in bed with the plantar surface of the foot on the bed, there is absent the normal resumption of position after tapping the patellar tendon, and the leg can be completely extended by a series of taps on the tendon. The superficial reflexes are unaffected.

(*k*) Sensation: This is absolutely unaffected.

Chapter 2 deals with symptoms due to lesions of the vermis. The only definite observation on this style of injury was a greater difficulty in phonation and articulation, more pronounced tremor and a greater difficulty in movements of the head and trunk.

Chapter 3 is devoted to symptoms of bilateral lesions of the cerebellum. Both sides show the results of injury, as outlined above under the head of unilateral symptoms. Speech is very much affected, being slow, drawling and often almost unintelligible. The muscles of the head and neck are very hypotonic, and the gait is seriously affected.

Chapter 4 discusses symptoms produced by lesions of the cerebellar nuclei. As it is impossible for these nuclei to be injured without a concomitant injury of the cortex, clear-cut pictures are impossible and we can only draw deductions between superficial and deep injuries. In the latter the symptoms are more intense, more regular and disappear less rapidly. The symptomatology differs only in degree.

Chapter 5, on the nature of the symptoms produced by cerebellar lesions, recapitulates and reviews the signs and symptoms enumerated above with an interpretation. The constancy, regularity and persistence of these symptoms incline one to believe that they are destruction symptoms. Vertigo is probably the only irritation symptom present. The early areflexia is probably due to the early extreme hypotonia.

1. Atonia. A constant, important and striking result of cerebellar injury.

2. Asthenia.

3. Retardation of movement, delay in initiation of contraction and relaxation. The cerebellum is probably a motor reenforcing pathway, and exerts its effect on the motor cell of the final common pathway.

4. Discontinuity and irregularity of muscular contraction. Sudden relaxations, astasia, incomplete fusion of elementary muscle twitches.

5. Ataxia: (*a*) asynergia; (*b*) decomposition of movement; (*c*) deviation from the line of movement.

6. Dysmetria, attributable to pathologic slowness in commencing contraction and effecting relaxation. Defective check element.

7. Speech defects—asynergia.

8. Eye movements. Asthenia prevents the maintenance of fixation with consequent deviation toward the rest-point.

9. Attitude.

Cerebellar function is probably active on the afferent side, integrating proprioceptive impulses and maintaining through the final common pathway the readiness of muscles to contract and relax.

Chapter 6 discusses functional localization in the cerebellum. Careful observations at the time of operation, deductions as to the probable course of the injurious agent, roentgenograms and necropsy experience in the author's cases shed no light on functional localization in the cerebellar cortex. Injury, no matter how slight, affected the entire side. All portions of the cerebellum except the antero-inferior surface were found affected, yet no limitation to any body segment was ever observed. The single exception was that injury to the vermis seemed to affect profoundly the musculature of the head, neck and trunk. He could find no support for Bárány's cerebellar localization.

RILEY, New York.

EXTRAMENINGEAL MENINGOCOCCUS INFECTIONS. W. W. HERRICK, Arch. Int. Med. **23**:409 (April) 1919.

This paper is based on the study of 315 cases of meningococcus infection which Herrick observed as chief of the medical service at Camp Jackson. In 40 per cent. of the cases the diagnosis was made before meningitis developed. Five per cent. did not develop meningitis. Most of the cases in Herrick's series showed signs of a general infection hours, days or weeks before the meninges were involved; this initial stage of sepsis was proved by blood cultures and necropsies. The stage of sepsis averages forty-eight hours before there is a local manifestation of the disease which is usually in the meninges, but often elsewhere. Herrick quotes six cases in which meningitis was absent or played a subordinate rôle, the predominating clinical pictures being sepsis, polyarthritis, pleurisy or empyema of the accessory nasal sinuses.

Herrick makes a plea for a change in name of the disease commonly called cerebrospinal meningitis. He recommends that meningococcus infection should be used to designate the sepsis which the intracellular diplococcus may produce and that meningococcus meningitis should be the term for those cases in which the meninges are involved in the local process.

This paper is extremely important and interesting. If Herrick is correct in his premises the most vital fact to be learned is the additional avenue of treatment, i. e., the intravenous injection of serum.

Society Transactions

NEW YORK NEUROLOGICAL SOCIETY

Three Hundred and Seventy-Second Regular Meeting, April 1, 1919

WALTER TIMME, M.D., *President*

FACTS AND FANCIES IN PSYCHOANALYTIC TREATMENT. Presented by DR. A. A. BRILL.

Dr. Brill stated that there are many reasons at this time why he chose this subject, chief among them being the fact that though psychanalysis had become a well-known and popular subject in many walks of life, many persons, even those in the highest standing in neurology and psychiatry who were sympathetic to psychanalysis, often showed a marked ignorance of its basic principles. It should not be forgotten that this form of treatment did not lend itself to the amelioration of acute forms of neurosis; it was, for instance, as impotent in removing so-called *shell shock* as it would be in removing hernia. Psychanalytic treatment had its limitations, and the cases selected for this form of therapy should not only be persons of normal intelligence and of good character, but they must be over the acute attacks.

The chronic psychoneurotics of normal mental make-up furnished the best cases and some of the most profound hysterias and compulsion neuroses had been cured after every other form of therapy had been tried in vain. Most of these people showed some sexual difficulty. Looking over the records of the cases sent to him during the first years of his practice, Dr. Brill found that over 60 per cent. were referred to him just because the patient spoke of sex or his physician expected it. An enormous amount of nonsense had been said and written about sex psychanalysis. To understand the strange manifestations frequently found in man, for example, abnormal fancy formation, or the actual perversions, etc., one had to be aware that the sex impulse consisted of many components and partial impulses which were congenital and developed with the individual. To the cultured person sex stood for much more than the sexual act. Conceived in this broad sense, one had no difficulty in comprehending the existence of an infantile sexuality and in realizing that no neurosis, even in a child, was possible in a normal sexual life.

A great many cases sent to psychanalysts could easily have been cured without this if the family physician knew something about the cause and effect of psychosexual disturbances. A great many physicians, especially those dealing with nervous patients, also needed to cultivate with them a better *rapport* similar to that cultivated by psychanalysts and designated by them as transference, a mechanism of approach concerning which there was considerable misunderstanding. This mechanism of transference was put into operation by the patient continually applying to the physician hostile or tender emotions which had no foundation in the actual relation, but were derived from the patient's unconscious fancies. The transference had to be managed with a great deal of tact and skill, for there was a tendency in neurotics with a floating libido to be ever ready to fix it on some one, identifying that person with the

good father who spoiled them or with the lost lover, etc., which was absolutely impossible in the relationship existing between patient and physician. The same mechanism was constantly found in normal life and on it was based attraction or repulsion.

Since many cases that were sent for analysis were not psychic, it was essential that one practicing psychanalysis should have a thorough knowledge of the mechanism of hysteria and the other psychoneuroses, as well as a good knowledge of neurology and psychiatry. Only those possessing these qualifications should prepare themselves for psychanalytic work. It should not be forgotten, also, that a pathologic condition could exist in a neurotic individual, and no analysis in the world would remove symptoms due to an organic disease. Thorough diagnosis of each case was of enormous importance before resorting to therapy, and therefore it was obvious that this was no subject to be played with by laymen. Psychanalysis was in the strictest sense a part of mental medicine and deserved the sympathetic encouragement of the profession everywhere.

A PSYCHOLOGIC STUDY OF SOME ALCOHOLICS. Presented by Dr. L. Pierce Clark.

The speaker presented this paper at this time because of the seriousness of the modern psychologic aspect of the problem, and through a realization of the fact that the influence of alcohol on modern life was not to be disposed of merely by bringing about prohibition. In excessive and habitual indulgences in alcohol there lay a multiude of causes and results for study and analysis. At one time alcohol might serve to bring about harmonious relations in a social group otherwise difficult; at another it might aid to bring about a state of pleasant *rapport;* while at still another it might make easy for free egress deeper and illy adjusted unconscious motives. Alcohol was dangerous only to those who used it for illegitimate means and ends. In many instances these alcoholic individuals had failed to complete certain emotional cycles of earlier development wherein alcohol prevented proper and satisfactory repression or socially acceptable sublimations. Extreme alcoholic repression called for its precise study and analysis and no less insistently than did alcoholic indulgence; it was possible that the ardency of the prohibitionist was a compensatory public inhibition for more intimate personal liberties denied or repressed. It was often popularly held that a man totally abstinent in one field might be licentiate in another. It might be well that the alcoholic suppressed his libido and only freed it in drunkenness, while a neurotic expressed himself sexually. As eminently practicable as legal prohibition might seem at this time, it must not be forgotten that a signal increase in all sorts of neuroses and psychoses would come about as a result of such measures. Neither individual nor social alcoholism would be cured by prohibition; these could be effected only by careful analysis which by uncovering the fault would open the way to applying a remedy.

All the conscious motives given for alcoholic indulgence were but specious casuistry, or at least inadequate rationalizations. To arrive at any true analysis of the defect, not only the conscious reasonings had to be considered, but an investigation conducted by all methods possible of the unconscious strivings met or perverted by alcoholic indulgence. The use of alcohol was proportioned to one's idea of its value, but the habitual alcoholic was especially tormented with and guided by strong and overweighted feelings and representations, the real roots of which lay in the unconscious. In many cases of dipsomania the homo-

sexual component was quite transparent, shown in the wish to "treat" other men. The fear and restlessness which introduced the so-called dipsomanic attacks were usually rooted on conflicts and repressions of the homosexual. Starting from the fact of bisexuality of human beings, both of organic and psychosexual attributes, surely the homosexual component must show itself in some way; if it could not be done openly and nakedly, then masks and symbols must be used. It showed itself in different degrees of sublimation. It was not merely chance that men so much enjoyed being among themselves and drinking together. Why did the alcoholic deliriant always see certain animals which were well known as sex symbols in general, and, especially seen by men as showing homosexual designs? Many alcoholics also had a "reverse Œdipus" complex which showed in deliria.

Unconscious homosexuality was only one factor in the alcoholic psyche; atavistic reminiscences played a large rôle. Atavism occurred in both healthy and abnormal states, but especially in the alcoholic one came close to atavistic remains, and chronic intoxication awakened and cleared the way for the ancient relics. Atavism gained new life in those psychically sick, and the drunken man exhibited unmistakable evidence of the sadistic-masochistic complex. The sadistic component explained numerous delinquencies and crimes that accompanied alcoholism. Alcohol numbed the higher functions. All drinkers did not become criminals, but alcohol certainly permitted hidden criminal desires to work out. The sexual component alone did not explain the behavior of alcoholics; the whole psychic content had to be considered. The unconscious had different levels or depths, and in different degrees of intoxication various levels of unconscious strivings and conflicts were released.

This conception of alcoholism afforded a scientific insight, made obvious the innate fault of the instinctive life, the fixation in the evolution of the emotional life, and showed the pattern plan of what sort of training out and social readjustment was necessary to heal such individuals. Anything less in the way of a comprehensive treatment was doomed to an early failure. In the definite periodic drinker the character usually showed less of the epileptic constitution per se and more of the instability make-up of the constitutional inferior. Altogether the study showed the truth of the contention that the line of treatment must always rest on the individual and social analysis of the particular subject under consideration, and that here, as in other profound neuroses, psychoanalysis might be undertaken. In the majority of cases one might hope for an arrest of the habit if proper precautions and lessened social demands were made on these special types of inferiors.

DISCUSSION

Dr. Horace W. Frink opened the discussion of these two papers on various aspects of psychoanalysis, taking up first the question of alcoholism in which, though his psychanalytic experience had not been very extensive, it had been very unhappy from the therapeutic standpoint. He found that whenever he reached an important and difficult place in the analysis the patient got drunk and repeated this almost indefinitely, and he had never yet been able to finish an analysis of an alcoholic. On the whole, the things Dr. Clark pointed out were more or less confirmed by the speaker's own experience; in some of his cases the homosexual element was prominent, in others apparently almost negligible. There were different types of alcoholics; three in particular. One was the true periodic drinker, a condition related closely to the fugue and to cases of alternating personality. Such types were sometimes observed among clergy-

men and other people of a pious turn of mind in their ordinary state, but who showed in periodic sprees an exactly opposite set of characteristics. Then there were cases of mild psychoneurosis in which drinking began as a drug is taken to allay the fears or depressions, but at length became part of the neurosis. Again, there was a type that was largely chemical, the man who drank through the external psychologic influences that were present and got up a state which called for new doses of alcohol to overcome it. Some of those cases had been successfully handled with hypnotism, which was the only variety of treatment that had been in any way successful in the speaker's experience.

Regarding Dr. Brill's paper, Dr. Frink recalled ten years ago at a meeting of the County Medical Society that Dr. Fisher read a paper on psychotherapy. The president of the society had prefaced the discussion by stating that psychotherapy having been in existence for some time it was time for final opinion and judgment to be formulated. The various methods were discussed, particularly the psychoanalytic, and much invective and sarcasm were let loose against it. For some time it was all one's life was worth to mention psychanalysis at a medical society meeting, to say nothing of reading a paper on the subject. But as time went on, through the efforts of a few sincere men who had to endure much in the way of insults and antagonism, psychanalysis had at length become more or less respected. The battle for its right to exist had apparently been won. On the other hand, in a way, the battle had just begun, for the greatest danger was now presenting itself, in the form of the undue popularity of psychanalysis and its practice by the untrained, to which Dr. Brill had alluded. A serious factor, and one largely responsible for this popularity, was the fact that it was being practiced by those who bore no medical degree and possessed no medical education. There were many objections of the most serious character against psychanalysis being practiced by nonmedical people. In the first place, a nonmedical person, even supposing he had a good understanding of psychanalysis per se, could not safely be trusted to practice. A physician was something more than a person who had listened to lectures on medicine and studied medical textbooks. In securing his medical education, in his hospital training, in his association with his professors and fellow practitioners, in the hours spent in studying his cases, something of the ancient ideals and traditions became embodied with the personality of the physician which was not to be found in the layman, an attitude toward patients and toward society in general. The patient of the layman, however well trained in psychanalysis, missed that something which was very important.

There were still more practical objections of the greatest significance. To do good work in psychanalysis was enormously difficult; it took years of the hardest kind of application and study to achieve anything approaching decent success. One could not learn to analyze such an enormously difficult thing as the human mind without every advantage and the layman had no such advantage. It was to be regretted that there were certain physicians who not only had worked with these nonmedical people, but had sanctioned and endorsed their working alone and had referred patients to them. Such physicians surely could not believe they were doing the right thing by these patients, nor fail to realize that these patients not only were not helped but seriously harmed. A physician who sent patients to people of this sort was prostituting medicine for some sort of pecuniary profit. There was still a further consideration and one that should give pause to those who regarded this situation lightly. The lay psychanalyst was not bound by medical ethics as was the physician, and medical ethics constituted a protection to the patient which he should be given.

A final objection: the practice of medicine by the nonmedical was against the law, and it was time that this situation was investigated from that end, for it was getting to be a menace and if more of it went on, the good work that had been done and the repute that had been won for psychanalysis by the serious workers would be in jeopardy. Psychanalysis was not Christian Science and could not be regarded in the attitude one could accord Christian Science. It was not a religion; it was a difficult and serious medical procedure, involving medical examination, medical diagnosis and psychotherapy by a trained physician.

Dr. C. P. Oberndorf endorsed what Dr. Frink had brought to the attention of the society as to the necessity for medical training in undertaking psychanalytic work. The question of selecting cases for analysis was sometimes a most difficult one, as there were many borderline cases. In some cases attempts at analysis would not only do the patient no good but might be harmful. This was especially true in certain cases of depression of the manic-depressive type where, during the active stage, any interference seemed only to accentuate the patient's sufferings without in any way relieving them.

So far as the speaker's experience with alcoholics went, he believed all that Dr. Clark had said was true psychologically. Alcohol furnished a convenient means of relaxation, but it was of most value in acting as inhibitory agent over the conscious mental censorship. Because of this, thoughts and actions ordinarily kept guarded were allowed to find egress. Possibly it was because of this being more or less realized and as such was contrary to one's best interests, that so many excuses had been unearthed for alcoholic indulgence. The relaxation which alcohol afforded was a very desirable one for the community. Prohibition would be a mistake, for though a substitute would probably be discovered, thus far none less harmful had been found.

It was very interesting to note the different types of individuals who found overindulgence in relaxing agents necessary, as they could be observed in the wards of Bellevue Hospital. In the alcoholic ward one would find the northern races, a frank type of people; in the drug ward was found the clandestine individual of the southern races. Many of both types would explain that it was from an unconscious urge they took the drug or drink. If alcohol was taken from these unbalanced individuals the tendency to adjust the emotional defect through drugs or other relief might be great. There was also great likelihood of an increase in neuroses and psychoses. The prohibitionist was putting the cart before the horse when he stated that alcohol was the cause of so many mental disorders; rather was the mental disorder the cause for taking alcohol.

Regarding Dr. Brill's paper, the crux of all psychanalytic treatment lay in the handling of transference and resistance, and that was difficult to adjust at times. Transference had most of its roots deeply planted; unless unconscious resistances were eradicated analysis could do little good, and unless the analyzer accepted them as the really vital part of his problem, he did not accept his task at all.

Dr. B. Onuf said that he had been so interested in Freud's work that he had been among the first to bring it to the attention of this society and to the profession at large. There were a few points that the discussion this evening had stimulated him to take up. In the first place, if there was any one entitled to give an opinion of psychanalysis, it was Dr. Brill, who was what the Germans called the *alt vater* of psychanalysis in the United States, and he was qualified in more than one way to practice it, first and foremost being his experience in

psychiatry. Dr. Frink's warning as to the peculiar fitness for psychanalytic work was absolutely in order. Nevertheless, all knowledge of it should not be kept within the medical profession, but it should be spread at large because it was always true that when medical methods were known to the people they acquired a sympathetic understanding of them which promoted a larger application, not possible when kept within a small circle. There was no doubt that if an understanding of psychanalytic theories was spread among the educated, great help would be gained in applying psychanalysis to the proper purpose. However, there was one thing about psychanalysts; it took a man's whole time, and it required special qualifications, an enormous amount of patience, a fine tact and other requisites that made for success, to say nothing of a good medical education. Dr. Brill stated that there was no harm in using psychanalysis in dementia praecox even if there should be no success; this was true in the case of an experienced psychanalyst, but there was danger in the hands of those whose experience had not been sufficient. He had known a case of dementia praecox in which one attempt at suicide after another followed certain revelations in the analysis. Dr. Clark had stated that most of his cases were constitutionally inferior, but many of the dipsomania cases were really cases of manic depression and the alcoholism was a part of the disease.

Dr. Hyman Climenko asked what type of cases should be sent for special study and treatment to the psychanalyst. Psychanalysis had come to be an important part of medicine, but did it cure symptoms or did it cure hysteria? Which were those that could be cured by the shortest route and at the least expense to the patient?

Dr. Russell G. MacRobert said that Dr. Frink's very modest characterization of his results with alcoholics tempted the question, because he knew how careful and painstaking his work was, if he did not consider that the psychogenic symptoms were not only attempted adjustments to real difficulties, but very many times and especially in more serious cases like pathologic drunkenness and early dementia praecox were the most satisfactory adjustments to his real difficulties that the patient could be contented with or was likely to find through psychoanalytic treatment alone.

Dr. Michael Osnato asked if the impression he had received this evening was true, namely, that psychanalysis had retired from the field of psychiatry altogether. Dr. Brill did not think it effective in the treatment of dementia praecox, which totaled more than 40 per cent. of all mental cases in institutions, and Dr. Oberndorf admitted that in manic-depressive psychoses psychanalysis had little therapeutic effect, and these cases totaled from 10 to 15 per cent. of all admissions. They must of necessity express great reserve regarding psychanalysis in general paresis, which totaled 15 per cent. of admissions; they spoke discouragingly of psychanalysis in paranoia, which totaled 2 per cent. They must admit the same nonsuccess in senile and presenile psychoses. Dr. Frink and Dr. Clark had spoken discouragingly of the psychoanalytic treatment of the alcoholic psychosis, which totaled about 15 per cent. of all admissions to hospitals for the insane. In fact, they definitely admitted their lack of success in handling these cases. Now was one right in believing that psychanalysis had entirely retired from the field of psychiatry?

Dr. Joshua H. Leiner asked under what category the dipsomaniacs who were epileptics and who had a real organic base, according to Oppenheim and Aschaffenburg, came in their relationship to psychonalysis.

Dr. Brill said that although his own experience with psychotherapy in alcoholism had been more successful than that related by Dr. Frink, he had nevertheless found the chronic alcoholic, as a rule, to be more or less deficient mentally, and whenever he succeeded in curing the alcohol craving something worse took its place which changed the individual from a menace to himself to a menace to society. Concerning the treatment by psychanalysis of dementia praecox, Professor Freud had always maintained that these cases should not be analyzed because the praecox mechanisms in themselves were their abnormal adjustment, and in analyzing them that adjustment was destroyed. As a matter of fact, the adjusted praecox must eventually be sent to a sanatorium, and the disturbed praecox must also remain in the sanatorium. Incipient cases of praecox, however, could sometimes be benefited by psychanalysis; and last but not least, a great deal of insight was gained by studying these cases, which was a great factor in prophylaxis. Dr. Climenko had asked what cases should be sent to the psychoanalyst. The answer was that only chronic cases that had resisted all treatment should be sent for analysis, although it would be better for the cases to be analyzed as early as possible. Dr. Osnato's query whether the psychanalyst had retired from the field of psychiatry was surprising; psychanalysts were psychiatrists first, and psychanalysis was only a branch of psychiatry. The answer to Dr. Leiner's question was that no attempt was made to treat by psychanalysis anything organic, but even organic cases like paresis and senile dementia showed freudian mechanisms in their delusions.

Dr. Clark was very glad to hear Dr. Brill's answer to the question as to whether psychanalysts had retired from mental medicine. One of the great advantages to psychiatry had been the psychanalytic method of approach, particularly in the benign psychoses and even in acute cases of manic depression. Properly applied in appropriate cases, it prevented the recurrence attacks. It also gave an excellent understanding of the mechanism of dementia praecox and a better insight into what to do for these cases through occupational and social readjustment, helping them even if they continued to follow a dementia praecox career throughout life. As regards its application to cases of alcoholism, psychanalysis did not show up brilliantly, but in it lay a method of approach as to the mechanism controlling the condition, and the only way one could do any permanent good was by way of influencing the unconscious motives in those types of cases that were clever and resourceful people who did not lack in intellectual power. It gave an insight into the mechanism and how to help them make their adjustments.

As regards the relation of dipsomania to epilepsy, as quoted by Dr. Leiner, this conception was a great mistake; the dipsomaniac was more closely allied to constitutional inferiority rather than epilepsy per se.

NEW YORK ACADEMY OF MEDICINE

Section on Neurology and Psychiatry

Meeting held April 8, 1919

Hyman Climenko, M.D., *Secretary, presided*

CASE OF DYSTONIA MUSCULORUM DEFORMANS. Presented by Dr. S. Philip Goodhart.

Dr. Goodhart presented this case, as rather typical of a rare condition, for confirmatory opinion. It was the first case of its kind in his private practice, although he had seen a few at the Montefiore Hospital. The patient was

a girl, aged 24, whose family and personal history showed no taint. The onset of the present condition was atypically sudden and its progress rapid. The young woman had none of the stigmata of neurosis, and she was not emotional. Under unusual emotional stimulus, as for example the present demonstration, the spasmodic hyperextension of the muscles became more pronounced and beyond her control. The will had but little influence in the control of the movements, which did not persist when the patient lay quietly recumbent.

Dr. Goodhart said that such cases had heretofore been regarded as functional, but it was now quite a general opinion that they belonged to a definite group whose pathology might reasonably be placed in the corpus striatum. This important ganglion, deeply seated within the hemisphere, was the center of tone; and its component structures, with their connections with red nucleus and cerebellum, represented the extrapyramidal influence of the several phases of muscle tone. The case presented was distinctly a disorder of that function peculiar to physiologic muscle activity comprehended by the term *tone*. Dystonia musculorum deformans, a condition originally described as such by Oppenheim, was essentially one in which part of the musculature was in a hypertonic, another in a hypotonic, and another in a normal state of tone. This variation of tone became manifest on movement only. The same set of muscles might be involved, at one time hypertonic and again hypotonic. Characteristic was the hypertonicity of the leg muscles and those of the trunk and pelvis, so that in walking the trunk appeared to revolve about the pelvis.

DISCUSSION

Dr. William M. Leszynsky considered that the only objection to the diagnosis would lie in the suddenness of onset of the condition. Dystonia musculorum deformans was a gradually progressive disease.

THE SURGERY OF CRANIOCEREBRAL WAR WOUNDS AND ITS RESULTS. Presented by Dr. Harold Neuhof.

Dr. Neuhof related facts drawn from his experience during the spring and summer of 1917 when he had the opportunity of treating patients with head wounds at U. S. Base Hospital No. 2 (New York Presbyterian Hospital Unit) attached to the British forces. These patients, the majority of whom had been operated on in the front area, fell into two classes: one in which there had been primary closure, and the other in which there had been drainage. The large majority of the first class did well, but sometimes secondary operations were necessary. When the dura had been lacerated by the missile or bone fragments a hernia cerebri was apt to develop, and such hernias often meant early acute brain infection with later development of brain abscess. Once a hernia cerebri appeared, hope for the ultimate outcome was not good. Concerning the second class of cases with wounds drained or incompletely closed, the results were on the whole unsatisfactory. The best ultimate outlook in serious head wounds existed after complete operations performed at hospitals in the advanced zone; operations short of complete were followed frequently by serious and often by fatal complications; and delayed primary operative procedures performed at the base generally had disastrous sequelae.

Accordingly, Dr. Neuhof concluded, when sent with a neurologic team to British Casualty Clearing Station No. 17 in Flanders in the fall of 1917, that complete operations should be done, whenever feasible, on all head wounds. It was realized that efforts at complete operation might result in an even

higher immediate mortality than the generally accepted 50 per cent. for wounds penetrating the dura; but in the patients who recovered there would be a greater likelihood of freedom from subsequent complications. Careful follow-up records were kept; and as they covered a period of more than a year, they showed figures which might be termed end-results. There was not a single report of late hernia cerebri, meningitis or brain abscess. This was the most striking feature of the follow-up of the series of head wounds. Up to the present there had been two reports that suggested the existence of petit mal, but none of convulsive seizures. Turning to the symptoms that continued after the patients arrived in England or the various colonies, headache and dizziness were the most frequent complaints, either or both of these symptoms being reported in the first months after operation, and had persisted in 20 per cent. of the patients. There was, however, a general trend toward improvement. Other subjective symptoms, such as insomnia, hypersusceptibility to sounds, inability to concentrate, and so on, were not infrequently mentioned; but these had no proportionate relation to the gravity of the wound. The reports in but one case suggested the possibility that insanity might have developed. Gross paralysis occurring after wounds damaging the brain in the parietal and parietofrontal regions was comparatively infrequent, and the majority of paralyses showed improvement before the patients left the casualty clearing station. Subsequently the course of the paralyses or pareses ranged from progressive improvement to complete disappearance. The development of spasticity was reported in but one case, and there was not a single instance of persistent aphasia. The conclusion to be drawn from the follow up of this series was that the ultimate prognosis for patients with craniocerebral wounds after complete early operations was far more favorable and cheering than was generally thought to be the case. The total mortality for the operated head wounds, including deaths from other causes and deaths after leaving the hospital, was 42 per cent. in dural penetrations in the first series of cases, and was reduced to 29 per cent. in the second series of head wounds with dural penetration. The latter group of cases was treated at Mobile Hospital 2, A. E. F.

Dr. Neuhof described the type of material that came under his care, the physical signs and neurologic manifestations, and gave in some detail the operative technic that was employed.

DISCUSSION

Dr. Foster Kennedy said that Dr. Neuhof had covered such a wide field that it was difficult to decide which parts of his paper to discuss. At the beginning of the war the neurologists and the surgeons acting with them seemed to be very much in favor of very wide exploration in almost all cases of cranial injury. As the war went on, that policy was more and more modified, and it would seem that the modification was associated with good results. At the hospital to which he was first attached he saw more cases of brain abscess within three weeks than he had ever seen before. The policy which had been inaugurated there was that a man coming in with a cranial injury was subjected to a revision of the wound. In the course of that revision, if a crack of the cranium was found, a trephining operation was automatically done. The result of that policy was the production of innumerable cases of brain abscess. It was very difficult to get the surgeons to realize that though they were dealing with a fracture, it might be a fracture in good position. They had to acknowledge that if they were dealing with an infected fracture of the femur without displacement, they would not cut down on it and plate

it. But this procedure with the skull was followed because it always had been done as it was believed to be necessary. But it was not necessary. When those same men got in the habit of looking at these wounds, not for cranial injury but to see whether there was cerebral injury, the mortality was very markedly reduced. A rule was followed afterward that men coming in with head injuries were examined neurologically. If they had cerebral symptoms they were then subjected to cranial exploration. But whether they had a fracture or not, if they had no symptoms referable to compression they were left alone. As Dr. Neuhof had said, the whole problem was sepsis. All these wounds were terrifically septic. The capacity of the scalp to become gangrenous and to have a widespread subcutaneous cellulitis of a fulminating type was a serious consideration. It was through such a surface that one had to operate. When a gratuitous opening was made in the skull, an avenue for infection of the meninges was laid open which usually had grave consequences and led rapidly to death. It was found that the dura had an ability to wall itself off, and the gross manipulations of the surgeons tended to break down those young adhesions. So they became very cautious and this caution was followed by success.

Dr Kennedy was glad to hear Dr. Neuhof speak against the policy of digital manipulation of the brain. Sometimes digital manipulation failed to remove a bullet from below the surface of the brain, and yet the patient subsequently recovered. The capacity of the brain to encyst foreign bodies was remarkable, and even large pieces of metal seemed to be borne without much discomfort.

Dr. Neuhof had said that he thought cerebral hernia was associated with a septic process. The speaker agreed with him up to a certain point, but he was not as pessimistic regarding the certainty of brain abscess following. The septic process was often quite superficial. Large hernias had disappeared under dressing every two or three hours; it was an edematous process which disappeared in four, five, six or seven weeks. Those patients, if transferred to England, would have died, for there had been a high mortality in patients taken back home; but when a patient could be kept in France he very often recovered. Those cases were most often the result of a purely local sepsis got rid of in the ordinary way by dressing very frequently.

There were some valuable lessons to be learned from the subsequent history of those cases. There never had been a time when so many men were so seriously hurt in the head as in the last few years. There had been ample opportunity to observe the results of very serious brain injuries in the mass. For instance, men returned to the firing line after they had been trephined a year or so before did not do well. They had all lost their nerve. They did not suffer locally from their injury, but they were not able to stand the strain, to adapt themselves again to their environment. But on the whole, very little after results, as far as ordinary peace time conditions were concerned, had developed. It was amazing that there were not more cases of epilepsy and more cases of mental breakdown as a result of head injuries. Emotional instability varied inversely with the seriousness of the wound; the more the man was wounded, the more calm his mind and emotional sphere.

Dr. Neuhof had not said anything about filling in the open wound by the surgeon after the removal of missiles or operation for the relief of pressure —trying to do an Albee operation on the head by implantation of bone graft. In this operation there was always uncertainty whether or not the area would become septic again, and it was not advisable. The same operator would make an artificial skull by imposing a piece of metal in place of the bone

defect. That seemed to be very bad plastic surgery. It seemed neurologically wrong. If there was a well healed area with the individual not suffering from it, one ought not to interfere any more with it, and a metal cap could be given to be placed on the outside of the head—a solution unlikely to open avenues for bacteria.

Some of the worst cases Dr. Kennedy saw did remarkably well. He was amazed to discover the resistance of the brain to very severe injury. One man had had a very large glancing wound of the left frontal lobe with crushing depression fracture sustained forty-eight hours before. The wound smelled gassy. Fourteen pieces of bone were removed and some of the lining of the helmet, all from the brain tissue. The wound was left open, but all of the destroyed tissues of the scalp were cleaned away. The patient had a series of convulsions after the operation, became completely aphasic, recovered, and was sent to England, where he had a plastic operation done, and when last heard of he was doing perfectly well and working as a laborer.

Another man had a small cranial crack but was without symptoms other than headache and some vomiting. The wound was in the region of the left temporal lobe and he had been operated on but nothing was found. After operation he became motor aphasic. The wound was reopened and a subpial hemorrhage was found. The wound was widened and the hemorrhage left undisturbed. He subsequently made a complete recovery. There was a series of cases of men struck on the helmet and sustaining a very small wound, the whole force of the blow having been taken by the helmet. They came down concussed, with pulse below 40 and remaining between 40 and 50 for three days, during which time they would vomit. There was no sign of local brain pressure, but the spinal fluid came out under extreme tension. The symptoms would last from three to five days; they would be quite well for from three to five days, and then they would have a relapse and that situation might be maintained for eight weeks. Many such cases were seen All these patients had the appearance of profound episodic compression of the medulla. By prolonged rest, without operation, they all recovered.

Dr. Goodhart considered very interesting the fact related by Dr. Neuhof that he placed great reliance on the location of the injury through the neurologic reflexes, and thought that was very important. He had a case under observation in which deep seated neoplasm had been suspected, the only sign being absence of abdominal reflexes on the right side, and ten days later there was evidence of pyramidal tract derangement.

Dr. Neuhof thought the cases to which Dr. Kennedy referred were different from those seen in his own experience, that is, wounds in a state of infection. The treatment for them was different and consisted in not doing anything unless there were definite indications from a neurologic examination At the base he saw six cases of hernia cerebri treated by persistent efforts at sterilization and which receded. Four patients developed subsequent complications and died anywhere from five to nine months after the recession of the hernia cerebri. This was surely ample reason for pessimism.

CLINICAL FEATURES ACCOMPANYING CHANGES IN THE SELLA TURCICA. Presented by Dr. Walter Timme.

Dr. Timme considered it was difficult to announce, in these cases, which came first, the sella changes or the actual metabolic and blood disturbances. He did not wish to be understood as saying that the clinical manifestations were produced by these changes in the sella turcica. Thirdly, he was not talking particularly of the pituitary gland but of the changes in the sella turcica itself; and those two things were not synonymous.

The normal sella turcica in an adult was quite variable in size, the limits being fairly large, the average anteroposterior measurement being from 10 to 12 mm. and in depth 8 mm. The sella turcica in woman as well as the pituitary body was larger proportionately than in man. The anterior lobe of the pituitary body was vastly more supplied with blood vessels than was the posterior or the so-called middle lobe. If through some emotional or other disturbance the abdominal arterial supply was diminished as to capacity due to excess amounts of epinephrin or other sympathetic stimulant, such condition would be followed by an increased amount of blood in the pituitary body and would have its effect on the pituitary.

The manifestations produced by enlargement or disturbance of the anterior or posterior lobes occasioned a different symptomatology. Hyperplasia or stimulation of the anterior lobe produced genital enlargement and general bodily growth; and disturbance of the posterior lobe was followed by metabolic changes, such as increased or decreased sugar tolerance, blood pressure changes, and changes in tonicity of the smooth muscle fiber.

Granting most of these things, what happened to the sella turcica, the pituitary body in which was more or less affected by these conditions? With a sella turcica so small that the pituitary body fitted snugly in the cavity there was no allowance for much expansion, and any increase in size for any length of time was accompanied by certain pressure changes; so that headache in the region of a line drawn between the two temples was produced by a pituitary body enlarged beyond the point where the sella turcica would allow it to enlarge. If such a process continued for any length of time, certain changes took place in the sella.

The small sella turcica was not necessarily synonymous with a low activity of the gland. One might find associated with a small sella turcica a marked increase in growth. In some patients also there were marked symptoms of hyperpituitarism, prognathous jaw, spaced teeth and symptoms of acromegaly, and in addition disturbance of sugar metabolism, excessive growth of adipose tissue and similar conditions. Up to a certain point these conditions were progressive. If, however, there was too long continued increase in size or pressure of the pituitary body against its bony capsule, then things began to happen to the sella turcica. In the first place, the bony capsule began to enlarge, the pressure itself producing an enlargement in all diameters of the sella turcica; or the anterior or posterior wall or base became eroded and absorbed. For a long time it was believed that the change produced in such a capsule as the sella turcica would be indicative of the portion of the gland which was enlarged; if the anterior clinoids were eroded then it was concluded that the anterior lobe was the cause and sexual or growth changes were looked for; and if the posterior, changes in metabolism were expected. That was not always true; the clinical picture might be different, and the reason was that if there was an adenoma or a foreign body or hyperplasia of the gland, it did not necessarily transmit its pressure on the portion immediately surrounding it but might exert it on a portion quite distant which became eroded.

Another possibility was this: Realizing that the pituitary body compensated for certain activities of other glands, it was clear that the pituitary body itself must enlarge in the performance of this compensation.

There was such a thing as a small sella turcica and a closing in of the sella turcica. None had been seen at necropsy entirely closed in, but there were roentgenograms in which the anterior and posterior clinoid processes seemed to be united.

A large sella turcica, large as compared to the gland it contains, might be associated with manifestations of pituitary disturbance without a feature of disturbance appearing in the roentgen-ray picture.

DISCUSSION

Dr. Leon T. LeWald thought that Dr. Timme had given a most careful and conservative paper on the interpretation of the relationship between the pituitary manifestations and variations in the sella turcica. Since he had mentioned the heart, in regard to the compensation of the heart it might be apropos to refer to studies recently made in the army of the hearts of aviators under conditions of low pressure and low oxygen supply to determine if the heart dilated. Even in such a large organ, measuring from 12 to 13 cm. in diameter, it was difficult to differentiate a few millimeters in size as the aviator ascended 20,000 feet. Manifestly, then, still greater difficulty must be encountered in attempting to differentiate the slight changes in size of the pituitary fossa. In the aviator, account was taken of his size, weight and height. In the study of the sella turcica this was impracticable; for after considering a large number of healthy individuals, one would be struck with the extreme variations to be found in the pituitary fossa. Dr. Timme appreciated that fact and had stated definitely that under certain circumstances it was difficult to make the clinical manifestations jibe with no apparent change in the size of the sella turcica, and yet changes might be going on in the gland which did not cause any change in the bony formation. It was impossible to measure accurately the lateral diameter of the sella turcica, so the anteroposterior diameter and the vertical were the only two out of three dimensions usually considered. By stereoscopic roentgenographic examination a more accurate conception of the size of the fossa might be gained, and this should be made a part of the roentgen-ray examination. There were two things that were striking in Paget's disease: The conformation of the skull, which was almost the opposite of the conformation in cases of acromegaly; and the difference in the size of the frontal sinuses, which were greatly enlarged in acromegaly but in Paget's disease were very shallow. There was a prominence of the frontal bone which made one think there were large sinuses; but as a matter of fact they were exceedingly shallow. The syphilitic theory of bony changes in Paget's disease had been entirely exploded, though it was repeatedly diagnosed as syphilitic disease of the skull.

When a clinical history did not agree with the laboratory findings or roentgen-ray findings, it was well to trace the case up and identify the individual with the report of the special examinations.

PHILADELPHIA NEUROLOGICAL SOCIETY

Regular Meeting, April 25, 1919

James Hendrie Lloyd, M.D., *President*

A CASE OF INJURY TO THE BRACHIAL PLEXUS, PROBABLY THE INNER CORD. Presented by Dr. Charles S. Potts.

History.—Lieut. J. was wounded on July 19, 1918, by a machine gun bullet which entered on the right side about two inches below the clavicle and three inches to the left of the shoulder joint. He at once lost power in the arm and hand, and for a short time spat blood. Complete paralysis of the arm with intense pain continued for ten weeks, after which the pain disappeared and

motion began to return. His condition improved for one month and then became stationary and remained so until he was first seen by Dr. Potts, about March 10, 1919.

Examination.—At this time examination revealed: Inability to flex the index finger at either the first or second inter-phalangeal joint, weakness in flexing the hand on the wrist and weakness of all the intrinsic muscles of the hand. In other words, only the muscles supplied by the median and ulnar nerves were affected. There was atrophy of these muscles and they presented a fully developed reaction of degeneration. Complete loss of pressure, tactile, pain and temperature senses were present on both dorsal and palmar surfaces in the middle, ring and little fingers and in the hand to a line running from the middle finger to about the middle of the wrist. Above this on the ulnar side of the forearm to the elbow there was diminished sensibility. At the present time there has been some improvement in motion, but practically none in sensation. This condition is very unusual. The syndrome resembles that described by Stewart and Evans and is due to injury of the inner cord of the brachial plexus. The symptoms do not indicate division of the inner cord, but indicate that it may be involved in adhesions and scar tissue.

PERIPHERAL NERVE INJURIES. Major G. E. Price, Major H. O. Feiss, and Lieut. W. B. Terhune contributed the paper which was read by Dr. Francis X. Dercum.

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DECEPTIVE HAND AND FOREARM MOVEMENTS IN PATIENTS WITH NERVE WOUNDS. Presented by Major Andrew H. Woods.

Motor Symptoms.—Sensory changes seem more interesting to most examiners and there is a tendency to neglect motor symptoms and to overlook their significance. The important motor symptoms consist in diminution or loss of normal movements, addition of abnormal movements such as twitching and tremors, and substitution movements. In substitution movements the observer may be deceived by changes in position brought about by normal muscles or other forces which resemble the movements ordinarily due to muscles now paralyzed. Instances of these substitution movements cited were:

1. Elastic rebound of a joint due to the pull of soft tissues on the same side of a joint as the paralyzed muscles after they have been stretched by the active antagonists.

2. Movements produced by the tightening or relaxing of inert muscles through the action of normal muscles or other forces; for instance in patients with musculospiral paralysis the dead extensors of the digits hoist up the wrist into extension through the tension produced on them by flexing the digits.

3. The musculospiral extensors of the digits normally assist the interossei in extending the middle and distal phalanges, and they may replace the interossei in this movement when the ulnar nerve is paralyzed. Other "tricks" were mentioned by which lateral finger movements are imitated.

4. Pronation in cases of median nerve paralysis may be started by action of the musculospiral extensors and completed by gravity. Supination in cases of musculospiral paralysis may be effected by the biceps even with the elbow in complete extension. The trick of rolling the flexed hand into supination by allowing it to fall along the outer curve of the thigh was referred to as one that has caused mistakes in diagnosis.

ACUTE SOFTENING OF THE BRAIN AND CORD WITHOUT HEMORRHAGE IN NONPENETRATING GUNSHOT WOUNDS CAUSED BY IMPACT CONTUSION. Presented by Dr. Williams B. Cadwalader.

Dr. Cadwalader said that his object in presenting the notes of the following cases seen in France was to call attention to the effect on the nervous system of the impact of a bullet or shell fragment without penetration. Softening of the brain and spinal cord can occur in nonpenetrating wounds without laceration or hemorrhage. The alterations of the central nervous tissue are caused solely by the local devitalization of tissue produced by the impact.

Case 1.—This patient was first seen in an unconscious condition with left hemiplegia. There was a large depressed fracture in the right parietal region. The wound was nonpenetrating. Operation was performed and the depressed bone removed. It was discovered that the dura was not lacerated and no evidence of hemorrhage could be discovered. The patient died a few days later and at the postmortem examination it was found a large area of the right cerebral hemisphere was undergoing softening. No evidence of infection, hemorrhage or thrombosis could be detected with the naked eye.

Case 2.—A soldier was wounded by a machine gun bullet, which lacerated the scalp and passed from the right to the left side, grazing the bones over the vertex of the skull. He became unconscious and suffered complete paraplegia. Repeated roentgen-ray examinations showed that there was no fracture. His paralysis improved slowly, and after six weeks he was walking with the assistance of a cane. Marked bilateral foot-drop persisted. The tendon reflexes were equal and only slightly exaggerated. A distinct Babinski sign was obtained but was not constant. The paralysis was flaccid and the gait was similar to that seen in peripheral neuritis. It is most probable that both paracentral lobules had suffered from the effects of the impact without hemorrhage. The absence of spasticity in the paralyzed muscle is singular. French writers have attempted to attribute this phenomenon to associated involvement of the cerebellum by contre coup, but this does not seem an adequate explanation. Dr. Cadwalader was inclined to believe that in cases of pure cortical paralysis there is always a tendency to flaccidity but it is not likely to be marked except in those cases in which only one segment of a limb is paralyzed.

Case 3.—Severe intramedullary lesions of the spinal cord not uncommonly result from bullet wounds of the spinal column notwithstanding the fact that the spinal canal has not been penetrated and the dura mater has not been lacerated. An instance of this was found in a soldier who was hit in the back by a machine-gun bullet which was localized by the roentgen ray between the bodies of the third and fourth thoracic vertebrae. There was complete motor and sensory paralyses of all the parts below the fourth intercostal space. The patient finally died. At necropsy the dura was intact but the cord, at the level of the lesion, was swollen and soft. No microscopic examination was made, but to the naked eye, for the extent of at least one whole segment, there was necrotic softening without hemorrhage. Laceration and compression could be excluded.

The effects of contusion on peripheral nerves are very confusing. In examining patients a few days after receiving a wound of an extremity, it was frequently noticed that the extent of the paralysis was so much greater than would be expected judging, of course, by the location and character of the wound. Moreover, considerable return of function frequently took place in a few days.

The following case illustrates the condition.

CASE 4.—A soldier was hit by a machine-gun bullet in the lower jaw about half an inch to the left of the midline. The wound of exit was to the right of the midline posteriorly at the level of the third cervical vertebra. The spinal canal was probably not penetrated for the roentgen ray showed that the bodies of the vertebrae were not injured, but the course of the bullet must have been very close to the bodies of the third and fourth cervical vertebrae. The man stated that the instant he was hit he fell to the ground and that on arising, which he did without assistance, both arms were completely paralyzed. He said that he had not sufficient power in his arms to throw them over the shoulders of his companions who helped him to walk to the dressing station.

The next day there was complete flaccid paralysis of both upper limbs. The movement of shrugging the shoulders was not completely abolished but it was very weak and a little weaker on the left side. Cutaneous sensation was intact. The tendon reflexes could be obtained though greatly diminished on both sides. The lower extremities and other parts of the body were normal, but the tendon reflexes were exaggerated. The plantar reflexes were normal. After the first week motor power gradually began to return in the arms and at the end of two weeks the patient was able to extend and flex the forearm and fingers a little, but all movements were still very weak. The patient was finally transferred but was recovering rapidly.

It is not easy to determine exactly what the lesions were which had caused such profound paralysis, but it seems quite certain that the brachial plexus had escaped direct injury, because the course of the bullet was too high and it also appeared unlikely that the cord and its roots could have been destroyed. It is not improbable that contusion or concussion might have been responsible for at least part of such an extensive paralysis.

Mitchell, Moorehouse and Keen, in their book entitled, "Gunshot Wounds and Other Injuries of the Nerves," published in 1864, say on page 2: "A ball passing above the brachial plexus or just over any large nerve, will sometimes inflict injuries as severe and lasting with reference to the destruction of function, as the bullet which severs the nerve fibers themselves. For this reason we have been unable to classify nerve wounds so as to study the relation between the extent of nerve injury and the amount of the consequent shock."

NEUROPSYCHIATRIC PROBLEMS OF AN ARMY AT THE FRONT, BOTH DURING AND IMMEDIATELY AFTER COMBAT was Discussed by MAJOR J. H. W. RHEIN.

Major Rhein said that the war neuroses as seen among the American forces presented some features which differed to a certain extent from those seen in the English and French armies. In the English army hysteria was more common in the soldier while anxiety states predominated among the officers. In the American army this was not true, anxiety states being common in the soldiers. The number of cases of major hysteria on the whole was less than in the French and English armies. Major hysteria was rarely seen at the front in army neurological hospitals where the cases seen could be classified for the most part as neurasthenics, psychasthenics, anxiety states, a few major hysterics and some which were examples of hyperemotivity representing what might be looked on as potential neuroses.

Soldiers who presented the symptoms of an excessive reaction to fear which for the moment incapacitated them and from which they recovered when removed from danger except for an anticipatory anxiety state, would develop fixed neuroses if they were not removed from exposure to front line experiences or if they were allowed to entertain prospects of returning to the front. The cases admitted to army neurological hospitals responded promptly to treatment of rest, good food, graduated exercises, suggestion and moral treatment. Between 60 and 70 per cent. of the cases were returned to their organizations within ten to fourteen days.

Fixed neuroses, consisting of major hysteria and anxiety states, were products of the contagion to which patients were exposed during their evacuation to the rear. In base hospitals were found hysterical manifestations in considerable numbers in contrast to the rarity of this condition at the front. The atmosphere at the front where these patients were treated within hearing of shell fire and where they understood that they were to return to their organization after some treatment, had a very different result from the standpoint of suggestion than that in the base hospitals which were far removed from the scene of warfare, where the safety of the situation emphasized in the minds of the men the dangers of the front, and where they picked up various symptoms from contact with other patients presenting fixed neuroses.

In over 50 per cent. of the cases coming into the army neurological hospitals the history contained a shelling experience. A diagnosis of hysteria was made in these cases. The trauma might be either emotional or physical. When the latter, the soldier stated that he had been blown over by a shell explosion. There was, however, no evidence on admission, of any actual cerebral concussion and rarely were the men unconscious when they reached the army neurological hospitals.

As to family predisposition in cases of war neuroses: A study of the histories of 332 cases showed that the family history was negative in 195 cases and positive in 137 cases for insanity, cancer, tuberculosis and nervous manifestations in parents, brothers and sisters. A history of previous nervous manifestations in the individual was found in about 50 per cent. of the cases.

Major Rhein said that there was no doubt that many healthy individuals developed in a short time due to the severity of their experiences, a state of nervous instability which would require months or years to develop in civil experience. Some cases showed psychotic reactions which presented transient symptoms suggestive of dementia praecox, manic-depressive psychoses and paranoid states.

A STUDY OF THE SPINAL FLUID IN CASES OF PRIMARY AND SECONDARY SYPHILIS. Presented by Dr. Joseph McIver.

This study was undertaken with the idea of determining so far as possible what percentage of cases of primary and secondary syphilis would show infection of the cerebrospinal fluid as might be demonstrated by the usual laboratory methods. The tests made on each specimen of spinal fluid were Wassermann test reaction, protein determination and cell count. Comparison of the blood Wassermann test has been made in every case with the findings in the spinal fluid. The duration of the disease, the present signs of syphilis and previous treatment have also been taken into consideration.

This study was made on a series of ninety-one cases, the majority of which were either in the primary or secondary stage of syphilis. The lesions manifested varied from early chancre to a fading secondary rash. A few of them,

however, were well past the secondary stage. Only one out of every four or five patients had taken any previous treatment and that was usually a very small amount.

All of these cases showed a 4+ Wassermann test reaction of the blood serum, as this was one of the determining factors as to whether or not a study would be made of the spinal fluid. The cell count was made immediately on removal of the spinal fluid. The average number of cells per cubic millimeter was 9. No effort was made to classify them. The greatest number of cells per cubic millimeter for any one specimen was 17. One of these was a case presenting a chancre of the lip with marked glandular involvement but no secondary rash; the others were cases of well-marked secondary syphilis. Taking a cell count of 5 per cubic millimeter as the average in normal spinal fluids, practically all of these cases showed a slight abnormality. Change in the spinal fluid of cases of secondary syphilis has been given from 10 to 90 per cent.

If we may consider a slight increase in cells an abnormality, then undoubtedly a large number of the primary and secondary cases of syphilis would show abnormal spinal fluid. This must be regarded as only of suggestive significance as there are a number of conditions that may produce an increase in cells. At the same time, we have to admit that cell counting is subject to error.

Only two of these cases showed a slight excess of protein in the cerebrospinal fluid, and curiously enough one of these was in the chancre stage, the other case was one of two years' duration with no previous treatment. The Wassermann test reaction of the spinal fluid was negative in every case with only two exceptions and they were of four and six years' duration respectively. Very little treatment had been given to either one.

In performing the Wassermann test reaction on the spinal fluid, 0.6 c.c. was used, 0.2 c.c. being the usual amount. The increased amount of fluid had no effect on the reaction.

Conclusions: 1. There is a slight increase of lymphocytes in the cerebrospinal fluid in the majority of cases of primary and secondary syphilis.

2. The increase in protein content does not appear as early as the increase in lymphocytes.

3. In this series, not a single 4+ Wassermann test reaction was obtained on the spinal fluid of primary and secondary cases of syphilis.

4. It does not seem reasonable to conclude that it can be determined by the examination of the cerebrospinal fluid from cases of florid syphilis just which cases will develop symptoms of the central nervous system.

DISCUSSION ON WAR NEUROSES

Col. Samuel Leopold said it was impossible to discuss all the papers as his experiences were chiefly with the war neuroses. He saw very few head cases at the front. The same applied to cases of injury to the peripheral nerves. In his first station where his organization was brigaded with the French it was simply a case of evacuating the patient as soon as possible. In the next station there were better facilities for studying the war neuroses. Colonel Leopold had the opportunity of handling some 200 cases in this area; 50 per cent. recovered in less than a week and were sent to the front. Fright or terror with exhaustion constituted the clinical picture. There were some cases of hysteria. It was interesting to find in the hysterical cases that the symptoms could be removed quickly, though not so easily as in the fright cases. This led him to believe that the latter was possibly a potential or beginning neurosis.

Major T. H. Weisenburg said that there were three types of cases observed in the General Hospital in Plattsburg Barracks, the only war neuroses hospital conducted by the War Department in this country. The first type of cases were those who came from camps in this country; the second, patients who had been to France but who had not been in combat; the third, soldiers with actual fighting experience. There was some difference in the type of neuroses presented by these three groups. The first were chiefly hysterical, the second were made up of neurasthenics and anxiety groups, whereas the majority of the combat patients were so-called intractable hysterics, with the exception of the officers who presented anxiety types. There was not much difference in the hysterical manifestations between the overseas and the local troops, except that the former were perhaps more difficult to handle because of the many hospitals through which they had passed.

A very striking fact that impressed itself on an observer was the makeup of the war neurotic. Plattsburg is an old post in a town of about 10,000 people, and the patients and medical officers were intimately associated. Major Weisenburg was on duty in this hospital for a period of about four months. This is mentioned because when one lives among these patients their mental makeup is much more apparent than it is to anyone who sees them only occasionally. Many of the overseas patients wore decorations to which they were not entitled and which the War Department had not authorized. These men were boastful and more than willing to talk about their fighting experiences, which were usually imaginary. One rather expects this from soldiers but not to such a great extent. They were difficult to manage; that is, there were more complaints and more infractions of the rules of the hospital than is usual. Individually these men were not a likable lot. This was further impressed on Major Weisenburg, who, after this experience in Plattsburg, was ordered to Base Hospital No. 1 in New York City, where he organized and had charge of the organic neurological service and where most of the patients had peripheral nerve injuries. The contrast was more than striking, for in the organic group the boys were less boastful, less talkative, less complaining, easily managed and much more cheerful than the men of the neurotic type.

The curing of the neuroses in Plattsburg offered no special difficulty. Major Weisenburg had charge of all therapeutic measures and instituted a so-called "atmosphere of cure," similar to that adopted in other neurological centers abroad. All the medical officers, hospital corps men and nurses were given lectures on the nature and curability of hysteria. The patients were mentally boosted and with the teamwork thus instituted, practically all intractable cases were cleared up in about two months. Once the reputation of the hospital was established, the cure of even the most difficult hysteric did not take very long, the hospital corps men and nurses doing equally good work with the medical officers.

One very interesting observation was made in regard to the question of suggestion. Before the armistice, it was very easy to bring about various symptoms and many precautions were taken to guard against adverse suggestions. While the armistice made no appreciable difference, and there were no spontaneous cures, nevertheless it was almost impossible after the armistice to suggest new symptoms. As an example of this, Colonel deSchweinitz spent a week with these patients and did his utmost to suggest new phenomena in studying visual fields. His experience is interesting in the fact that it was impossible for him to accomplish this, although he found the usual tube fields and visual contractions of the ordinary hysteric.

Regarding peripheral nerve injuries: In organizing the service in Base Hospital No. 1, New York City, the usual faradic and galvanic batteries were discarded and the so-called condenser apparatus was used. This apparatus has a great advantage because it is possible to measure accurately the amount of current in microfarads necessary to produce stimulation of a nerve or muscle. A normal muscle or nerve will respond to about 0.03, whereas an interrupted nerve will not respond at all. A partially interrupted nerve will take about 0.1 microfarads. Also this current has the advantage in not being painful.

The greatest impression that the peripheral nerve cases made on Major Weisenburg was the ability of the remaining normal muscles to substitute for the loss of action of those which were paralyzed. For example, in musculospiral palsies, the patient by flexing his fingers, by means of the median and ulnar nerves, produced a pseudo-extension of the wrist, giving the appearance of extension in the musculospiral distribution. In cases in which the musculospiral nerve escaped, and in which the median and ulnar nerves were paralyzed, the opposite took place; that is, the patient first extended his wrist, causing an approximation of the fingers with the palmar surface, giving the impression of median or ulnar nerve action. The ability to do this depends largely on the person and on the length of time after the injury. A bright, active, ambitious boy, with thin fingers will be much more successful than a boy less perspicacious with thick fingers.

In this connection it is interesting to refer to a recent paper by J. R. Hunt, appearing in *Brain,* 1918, in which this author claimed that there are two systems of the motor fibers transmitted in the peripheral nerves. This author claimed that there are a certain number of nonmedullated fibers in peripheral nerves transmitting so-called paleokinetic fibers, subserving associated movements, which according to him, come back first in regenerating peripheral nerves. He based this theory largely on two cases of musculospiral palsy in which he had seen, what appears to Major Weisenburg to be nothing more than a pseudo-extension of the wrist, brought about by the action of the median ulnar groups With Major Woods he had studied a great many cases of musculospiral palsy, in which all showed this phenomena. In a number of such cases, subsequent operation had shown the two ends of the musculospiral nerve to be completely divided and some distance apart. Dr. Hunt's theory therefore has no basis.

At first Major Weisenburg was somewhat loath to advise operations in peripheral nerve injuries unless there was definite evidence of total interruption. Experience, however, has shown him that wherever the progress is slow and not what it should be, an exploratory operation in the hands of a competent surgeon is advisable, for operation cannot do harm and in nearly all such instances, even when there is no actual interruption of a nerve, there has always been found sufficient surgical evidence to warrant operation.

Lieut. George Wilson said that his neurological experiences in France were with Base Hospital No. 34 and with the Seventy-Eighth Division. During June, July and the early part of August, 1918, he saw a great number of cases of neuroses that had filtered all the way back to Base Hospital No. 34 which was located at Nantes, because the facilities for caring for these cases in the front area were not complete at that time. A great number of these patients responded readily to suggestion, isolation and other methods so that only a few had to be sent to Base Hospital No. 117. At Nantes Lieutenant Wilson saw a limited number of peripheral nerve cases, but as

Base Hospital No. 34 was the only functioning surgical hospital in that area, those cases were evacuated to other hospitals not entirely completed in order to make room for the great number of wounded who came in during those critical days.

About the middle of August, Lieutenant Wilson was assigned to the Seventy-Eighth Division as psychiatrist and remained with that organization until November 25. When the soldiers suffering from the various neuroses were seen in the triage and kept, so far as possible, in a nearby field hospital, 75 per cent. were returned to their organizations in ten days. When these men were seen before their tremor and other symptoms had become fixed it was a relatively simple matter to straighten them out and return them to duty, much easier than it had been in the base hospital. In the last three weeks of the war, which Lieutenant Wilson spent in the Argonne sector, the number of cases of the psychoneuroses that he saw were very few. This may have been due to the fact that the weak sisters had been weeded out or, what is more likely, that the outlook had changed from a long and cruel war to a short and merry one.

Col. Wayne Babcock stated that he had been especially interested in cases of nerve injury. Over 350 had been admitted to General Hospital No. 6, Ft. McPherson, Ga., and something over 200 patients had been operated on. About 260 nerves had been explored under the knife. Something less than half of the nerves had been subjected to neurolysis and the rest to suture. The interesting feature had been that the proportion of sutured cases had increased with experience. This applied especially to certain neuromas in continuity with physiologic interruption, the paralysis from which had persisted in a number of cases without improvement three or four months after neurolysis and hersage. The sutured cases in general were giving more promise. It was too early to say more. There had been a number of interesting phases in the work; one was the study of partial nerve palsies in relation to intravenous localization. For example: In a case recently operated for foreign body near the internal condyle of the humerus the ulnar paralysis was limited to the flexor carpi ulnaris with complete sensory loss. As the sensory fasciculi and those supplying the flexor carpi ulnaris run in the anterior inner portion of the ulnar nerve at the elbow, it was interesting to see whether that corresponded to the lesion when the nerve was exposed. On exposure a little pocket was found in the anterior internal portion of the nerve, in which rested a small foreign body. In some of the other cases, there had been a somewhat similar correspondence between the tracts interrupted and the areas paralyzed. Most interesting had been the mapping of nerve patterns of exposed nerve trunks by the electric current.

Some of the results of operation had been rather anomalous until explained by careful study of the cases. For example: In one case of peroneal division, for which a suture was done, the extensive sensory loss apparently cleared up promptly. The boy said he had return of feeling on the third day after operation, and it was found that he had practically regained all sensory power, both to touch and to pain. The explanation was found in the fact that the musculocutaneous branch had not been divided by the injury and had been freed at operation, while only the anterior tibial fasciculi had been sutured. Of course in this case there was no early return in motion. Another interesting phase has been the size of the gaps that could be bridged, a technical problem of importance owing to the unreliability of nerve grafting. By adopting various expedients, in about 120 cases with gaps from 3 to

15 cm. in length, no case was found in which an end to end suture could not be made. The gaps were overcome (1) by the displacement of the nerve from its normal location—as the ulnar to the front of the elbow; the median from a deep to a superficial location; (2) by flexion or extension of adjacent joints; (3) position, adduction of arm, adding 5 to 8 cm. of slack to the cords of the brachial plexus; (4) by the normal slack and elasticity of nerve trunks.

To this has been added the interesting problem that has appealed to many, as to whether the nerve could be lengthened progressively under multiple operations. This Colonel Babcock had a chance to observe in one case in which a man had an injury extending from the chest along the arm. There was an extensive laceration of the median and ulnar nerves. In the first operation, a gap of about 5 cm. of the median nerve and 11 cm. of the ulnar nerve were overcome with suture. The nerves had so elongated three months later, that it was possible to excise an additional 10 cm. from the median nerve and 6 cm. from the ulnar nerve, and obtain end to end apposition with suture, although a total of 15 and 17 cm., respectively, had been removed from the nerves.

The rapidity of healing in nerves was also brought out by another case in which there was a gap of about 12 cm. in the sciatic nerve. During this operation, despite an acute flexion of the leg on the thigh, the tension was so great that when the man moved a little on the table after four or five stitches were introduced, the nerve pulled apart. Colonel Babcock went ahead again, and the nerve was finally well sutured by fine silk sutures. The patient was tied up, as they thought, very carefully, but that night, as Colonel Babcock went to the ward, he found the man had flexed the thigh on the abdomen and knew the nerve was pulled apart. Twenty hours after operation Colonel Babcock reoperated, but, on exposing the nerve, it was found to be absolutely together, and on taking hold of the ankle and extending the leg twenty degrees, he could see not the slightest tension on the sutures. The explanation was that the hamstrings had quickly adhered to the nerve, splinting it perfectly. As a result, instead of waiting many weeks to extend flexed joints, Colonel Babcock now started them quite early.

An added reason came from observing other men who deliberately extended their arms or legs, although they had been told not to do so, and who, despite this, had evidence of returning function corresponding well with the progress made by patients who had had short gaps overcome with suture.

Major K. W. Ney stated that during the American offensive he was associated with evacuation hospitals or mobile units near the front in the capacity of senior member to a neurological operating team. This team did head surgery almost exclusively. In all cases as complete a neurological examination was made as circumstances would permit. All brain operations were done under local anesthesia, which proved to be the anesthetic of choice. When head wounds were complicated by other injuries the head operation was done under local anesthesia and a general anesthetic given for the debridement of other wounds. The operative technic employed was complete excision of the scalp wound; removal of the bone injury *en bloc;* evacuation of the disorganized brain substance by having the patient blow against his closed lips, or by coughing, the increase of intracranial pressure by this method proved very effective in the removal of the destroyed, oozing, semifluid brain substance. The dura was sutured whenever possible, but in all cases the cranial defect was covered by scalp, and drainage was never used.

If the patient survives the anatomic death which usually takes place in the first few hours, he then has to face the dangers which so often resulted in an infective death. It was in the prevention of this infective death to which we directed most of our efforts and where we found our reward by doing an early and complete operation. The mortality early in the service in gunshot injuries of the brain was between 50 and 60 per cent. in patients who had avoided an anatomic death, but who died from infections. By the above operative technic, advocated by Colonel Cushing, we were able to cut this figure down to less than 10 per cent. In a series of seventy-nine cases Major Ney's team lost but five from all causes. All brain cases were retained for a period of from eight to ten days after operation and it was often remarkable to watch the clearing up of preoperative neurological symptoms during this period. The most remarkable experience, however, has been the clearing up of many cases which looked hopeless at the time of operation, as well as when they were evacuated back to the base. The prevention of the infective sequela promised them life, but it seemed almost as though it would be better to let them die than to prolong an existence of absolute helplessness—but the function of the members of the team was to save life, and in doing this thought they had done all; but what nature and reeducation has done in many of these cases has been most remarkable. In a recent visit to Cape May, N. J., Major Ney found a patient whom he had classified in his personal records as dead. This man had had an extensive amount of brain destruction with a complete right hemiplegia and aphasia. At operation a foreign body was removed from the lateral ventricle and he was not expected to live. The man was evacuated and it was thought that he had died. You can imagine Major Ney's surprise when he found that soldier playing ball and talking perfectly.

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